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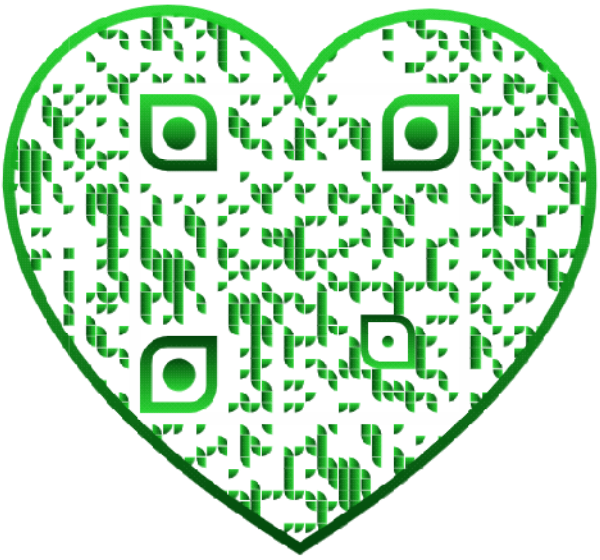

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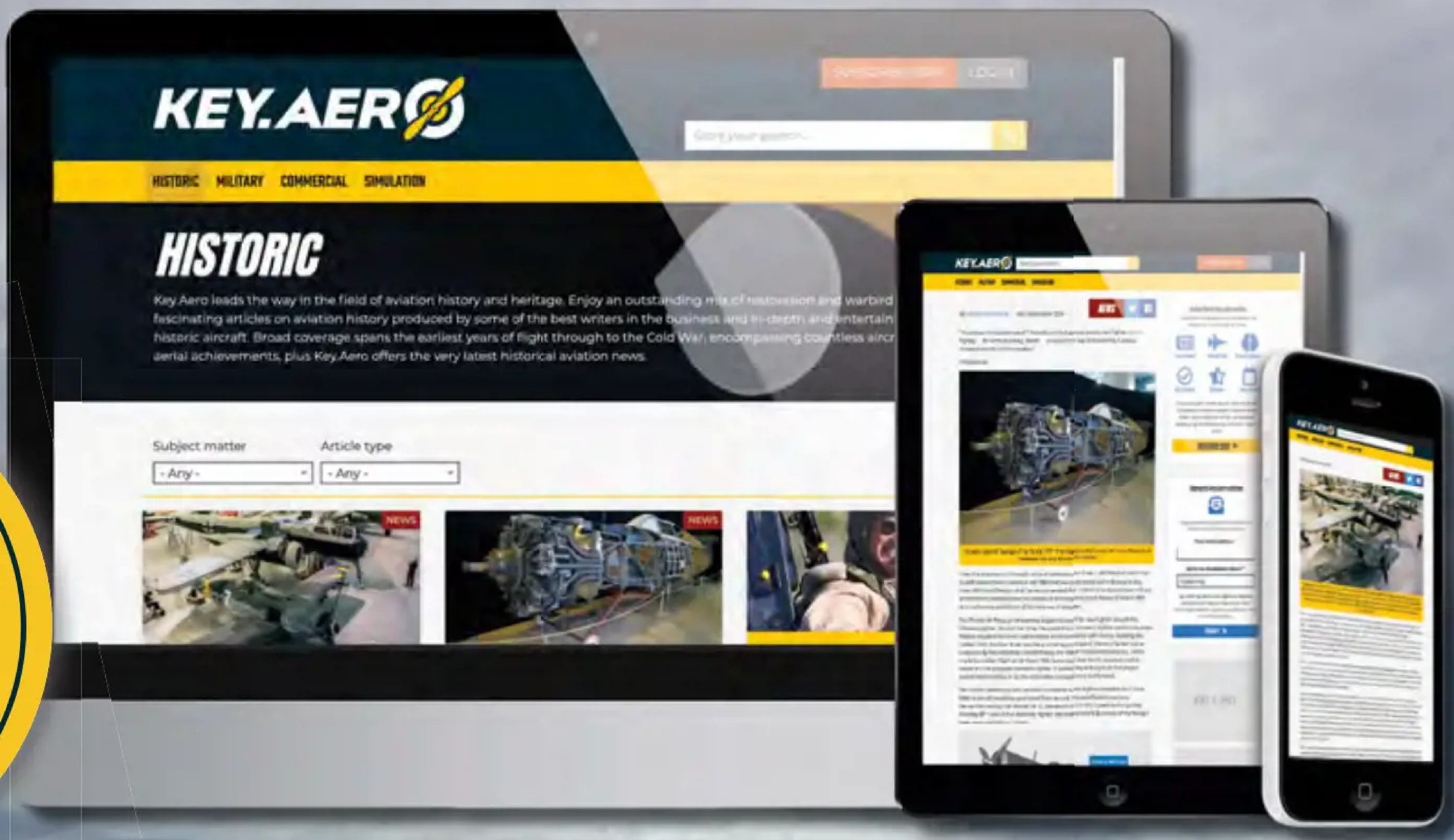

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Comment

Manned/unmanned: solving combat mass needs

Right: ***The F-16D VISTA, now known as the X-62, based at Edwards AFB, California, is playing its part in supporting the use of CCAs***
Richard Gonzalez

The concept of performing manned/unmanned operations isn't new, but it's closer than ever to becoming a reality. With the rush to increase combat mass, as we have seen in Ukraine and would be likely in any China/Taiwan conflict, there is obviously a desire to avoid having to buy very expensive fifth-generation aircraft like the F-35 Lightning. For several years, the USAF has been working on the Loyal Wingman concept, now known as the Collaborative Combat Aircraft (CCA). There are several possible options from the likes of Boeing, General Atomics, Lockheed Martin, Northrop Grumman and the little known Anduril that could work alongside manned fighters. For more, see *Fighting for the Future*, pp46-49.

The time needed for pilots to engage ground-based air defences, advanced fighters and long-range missiles while trying to conduct their missions has shrunk, so a solution needs to be found. CCAs could provide several defensive services to the manned fighter – electronic warfare, suppression of enemy air defences, etc – to allow pilots to concentrate on the mission.

The USAF AFCENT Commander, Lt Gen Derek France, commander of the USAF AFCENT, recently said at the Manama Air Power Symposium in Bahrain in November: "Unmanned systems are robust, have operational reach and the ability to loiter in high threat areas,which means they can identify targets and sense the operational environment with little need to communicate. With automated and artificial intelligence enhancements, they should be able to enable rapid and prioritise decision making. They must be able to identify friendly, neutral and hostile actors and pass information in real-time for rapid prosecution."

With increased production rates, a mesh of network systems could be developed to send multiple unmanned systems equipped with varying sensors to cover large areas and pass data to increase situational awareness for other assets. However, Lt Gen France was quick to stress: "It only works if they are affordable and produced rapidly, so those industry partners who produce small numbers of gold plated systems will be of limited use in the air war."

Another benefit of CCAs is that they have fewer life support requirements compared to a pilot inside a cockpit. Instead of environmental control systems, the space can be dedicated to sensors and computing power to process information and make lower level decisions in combat. Nevertheless, France stressed: "Unmanned systems are not one-size-fit-all, with the commander being a pre-requisite for target identification and evaluation, because misidentification could lead to catastrophic results."

Alan Warnes
Editor at large

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***Main:* An F-35B (ZM162/'028') departs a damp RAF Marham. The UKLF will welcome the last 13 of its initial 48 aircraft to the Norfolk base in 2025** *MOD Crown Copyright/Sgt Nik Howe*

***Cover Image:* Celebrating 50 years of Turkish phantoms is this specially painted F-4E, 77-0303** *Cem Dogut*

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The oldest aircraft in service in Croatia, a two-seat AT-802 with classical landing gear. It is one of two such planes acquired in 2001
Croatian Ministry of Defence

Ukraine and Russia exchange long-range missile strikes

ON NOVEMBER 18, rumours began to circulate that the US had finally given Ukraine permission to use US-built long-range missiles to strike targets deep inside Russia, but predominantly in the regions bordering Ukraine and against targets where North Korean troops are concentrated, such as the Kursk Oblast. This was officially confirmed the following day, but details of any limitations were not disclosed.

In addition to getting permission to fire MGM-140 ATACMS ground-launched supersonic tactical ballistic missiles from the M142 HIMARS and M270 multiple launch rocket systems, Ukraine was also allowed to use UK/French-supplied Storm Shadow/SCALP-EG air-launched cruise missiles (ALCMs) containing US-made/designed components. The latter are fired by the Ukraine Air Force (UkrAF) Su-24 Fencer fleet, consisting of Su-24M *Fencer-D strike* aircraft and Su-24MR *Fencer-E* reconnaissance jets operated by the 7th Tactical Aviation Brigade (brTA) based at Starokostiantyniv Air Base in Khmelnytskyi Oblast.

SCALP EG
N°2465
A French-supplied SCALP-EG ALCM is seen here below Su-24M '09 White' of the 7th brTA. *UkrAF Command*

The first strike using six ATACMS was on November 19, against a Russian ammunition depot in Karachev, Bryansk Oblast, while the first launch of 12 Storm Shadow/SCALP-EG ALCMs came the following day, against a Russian command post in Maryino, Kursk Oblast. Reportedly, a substantial number of Russian and North Korean casualties were inflicted in the latter strike, including high-ranking officers.

Meanwhile, Russia was not sitting idle. On November 19, President Vladimir Putin approved an update to Russia's nuclear deterrence doctrine, which states that "aggression by any non-nuclear state, supported by a nuclear power, will be seen as a joint attack on Russia." Furthermore, on November 21, one of Russia's experimental ground-launched hypersonic intermediate-range ballistic missiles was launched from the Kapustin Yar proving ground in Astrakhan Oblast against Ukraine's state-owned Pivdenmash aerospace company, based in Dnipro, Dnipropetrovsk Oblast. The new missile, codenamed *Oreshnik* (reported as *Kedr* by the Ukrainians), was equipped with six warheads, each reportedly containing submunitions, and has been described as difficult to intercept due to its high terminal speed. In his official address on November 21, Putin announced that "the war in Ukraine has now become global", blaming the West for Ukrainian missile strikes inside Russia that, in turn, provoked a retaliatory strike.

An engine section of a US-built MGM-140 ATACMS missile at Kursk-Khalino Air Base following the attack on November 25 *Russian MoD*

Meanwhile, Russia continued its relentless advance in Ukraine, making the highest territorial gains in November, reportedly 235sq km in the week from November 18-24 alone, despite setting an absolute record in personnel losses the previous week. Another record was set on November 26, when 188 drones were launched against Ukraine, following the large-scale combined missile/drone attack on November 17, with more than 200 drones and missiles, ALCMs included.

Of note is the fact that just as Ukraine was given permission to deploy Western long-range missiles against targets in Russia proper, the number of guided glide bombs (KABs) launched by the Russian Aerospace Forces against Ukraine plummeted from 130 to 80 a day, presumably due to the fact that Russian strike aircraft were now forced to move and operate only from bases outside the range of missiles. Confirmation that they pose a major threat to Russia's tactical aviation operations came on November 25, when Kursk-Khalino Air Base in Kursk Oblast was struck by at least five ATACMS missiles. This came just two days after ATACMSs were used to strike an S-400 (SA-21 Growler) surface-to-air missile system at Lotarevka, also in the Kursk Oblast.

Chinooks, Pumas and Watchkeeper drones axed

17 Puma HT2s face the chop without a replacement in the pipeline *Ben Stanley Hall*

ON NOVEMBER 20, UK Defence Secretary John Healey unexpectedly announced a wide range of cuts to the UK military, in a bid to save £500m in the defence budget over the next five years.

The RAF's Joint Aviation Command has taken the brunt of the cuts. The ageing fleet of 17 Puma helicopters, in service since 1971, was substantially upgraded to the HC2 derivative between 2010-12 and had been threatened with the axe for several years, but will now be withdrawn from service on April 1, 2025. The Puma is home-based at RAF Benson, Oxfordshire, serving 33 Squadro, and 28 Squadron, the Chinook and Puma Operational Conversion Unit, while there are also two overseas squadrons: RAF Akrotiri in Cyprus hosts No 84 Squadron, providing a Search and Rescue capability, while Medicina Lines in Brunei has Pumas of 230 Squadron serving the British Army Warfare Training School and the Gurkha Battalion in Brunei Darussalam.

The UK MOD announced that, from April, Airbus UK has been contracted to provide six Airbus H145s, known as Jupiter HC2s, to replace the Pumas in Cyprus and Brunei, with deliveries expected in 2025. Presumably No 33 Squadron will disband next year and a capability gap will prevail until the new medium helicopter (NMH) contract is announced. Only the Leonardo AW149 remains in the bidding process after both Lockheed Martin (with S-70 Black Hawk) and Airbus Helicopters (with H175M) withdrew. It has been suggested that the contract is for around 30 helicopters, but the NMH concept will undoubtedly be reviewed given the Puma's impending retirement. The winner is due to replace the H145s in Cyprus and Brunei, but that decision could be subject to change.

The decision to withdraw 14 of the older Chinooks isn't so surprising, given that several of the 60-strong fleet have been in service since the early 1980s, with a couple amassing in excess of 20,000 hours. The Chinooks serve two operational units: 18 and 27 Squadrons at RAF Odiham, Hampshire, and 28 Squadron, the operational conversion unit, at RAF Benson.

The RAF is set to acquire 14 extended range CH-47F Block IIs in a foreign military sale reputedly worth £1.4 billion that the UK's Defence Equipment and Supplies (DE&S) announced in March: "The helicopter has double the range of a standard Boeing Chinook and is capable of air-to-air refuelling, with the ability to carry up to 55 personnel or 10,000kg of cargo."

Meanwhile, the Thales Watchkeeper, a modified Hermes 450, has been dogged by problems from the outset. Delays and cost overruns have meant they only entered service in 2018, eight years later than planned, and have been unable to operate in poor weather. It has been claimed that the technology used in the £5m drones is already outdated, limiting their combat effectiveness. The surviving 46 Watchkeepers (many are believed to be in store) serve 47 Regiment, Royal Artillery.

Mystery drones target USAF bases

SECURITY HAS been stepped up around four USAF bases in the UK after numerous drones were sighted on several days around key sites. Since November 20, unmanned aerial systems (UAS) have flown close to RAF Mildenhall, Lakenheath and Feltwell in Suffolk, as well as RAF Fairford in Gloucestershire, where B-52 bombers are currently operating. Following several days of incursions, the British Army deployed 60 specialists to help deal with the threat.

In a statement, USAF in Europe - Air Forces Africa said: "Small unmanned aerial systems continue to be spotted in the vicinity of and over RAF Lakenheath, RAF Mildenhall, RAF Feltwell and RAF Fairford since November 20. To date, installation leaders have determined that none of the incursions impacted base residents, facilities or assets. The USAF is taking all appropriate measures to safeguard the aforementioned installations and their residents.

"The number of systems has fluctuated and they have ranged in sizes and configurations. Our units continue to monitor the airspace and are working with host-nation authorities and mission partners to ensure the safety of base personnel, facilities and assets. To safeguard operational security, we do not discuss specific force protection measures, but we retain the right to protect our installations."

The origin of the UAS activity remains unknown, but it has been reported that defence experts believe the activity has all the hallmarks of a 'state actor' with Russia being most likely to be behind the co-ordinated activity.

Wildcat downs drone with Martlet

Aircrew and engineers from 815 NAS, individuals from Thales and QinetiQ – alongside the Wildcat HMA2 and a pair of Banshee target drones MOD/Crown Copyright

ON OCTOBER 10, a Leonardo AW159 Wildcat HMA2 from 815 Naval Air Squadron (NAS) based at RNAS Yeovilton in Somerset, completed a live air-to-air firing of the Martlet lightweight multi-role missile (LMM), against an uncrewed air system. The engagement – conducted as part of Talon Strike, a two-day weapons trial at RAF Manorbier's air defence range in Pembrokeshire – is the first time the maritime attack helicopter has independently detected, tracked, and destroyed an aerial target without external assistance.

Aided by the aircraft's Seaspray 7400E radar and nose-mounted electro-optical designator system (EODS), the crew from 815 NAS were able to locate and intercept the Banshee drone, before neutralising their target using in-flight missile guidance commands. Although originally acquired for use against agile, asymmetric surface threats, this latest achievement unlocks an additional air-to-air capability for the Martlet, heralding a significant milestone ahead of full operational capability (FOC) next year.

"This is a fantastic development for the helicopter and a significant advancement in maritime strike capability for the Royal Navy, further refining our ability to deter and neutralise airborne threats," said Cdr James Woods, Commanding Officer of 815 NAS.

Manufactured by Thales, the Martlet – named after a mythical bird that never roosts – was developed to satisfy the Fleet Air Arm's Future Air-to-Surface Guided Weapon (Light) requirement. Conducted under the auspices of the Operational Advantage Centre, the Royal Navy's lead organisation on tactical development, this latest trial is the culmination of years of vigorous research and evaluation by various defence industry partners.

A modern derivative of the Starburst man-portable surface-to-air missile, it utilises laser beam-riding technology to ensure accurate and secure guidance against complex adversaries, operating within challenging maritime and littoral environments.

"Martlet is a highly capable, cost-effective weapon in our arsenal," explained 815 NAS pilot, Lt Dave Guest. "It is really important that we can demonstrate the Wildcat's effectiveness in engaging targets such as uncrewed systems, and that we can do so on our own without requiring the assistance of other assets."

Talon Strike's success followed on from the recent Sea Venom weapon trials on October 3, during which an example of the anti-ship missile was launched and guided from a Wildcat against a surface vessel target. The Anglo-French design used a two-way datalink to relay imagery from its infrared seeker to the operator, providing an effective lock-on-after-launch (LOAL) capability. Successor to the Sea Skua, a system previously fielded by the venerable Westland Lynx, MBDA's sea-skimming weapon is expected to achieve FOC in 2026 – a year later than Martlet.

Mike Mew, MBDA's tactical strike director, said: "We're pleased that the completion of these key Wildcat integration trials will [allow] the Royal Navy to field the full capability of this system, providing a critical strike capability for Carrier Strike Group 25 and beyond."

James Connolly

Armed with five Martlet lightweight multi-role missiles (LMMs), the Wildcat HMA2 launches from its forward operating base in South Wales, prior to intercepting the Banshee target drone. The maritime attack helicopter is capable of carrying up to 20 Martlets across its two weapon wings, which were designed and tested by Leonardo Helicopters at their manufacturing facility in Yeovil, Somerset. MOD/Crown Copyright

RAF Atlas celebrates ten years

A CEREMONY has been held at RAF Brize Norton to mark the tenth anniversary of the Airbus A400M entering service with the RAF.

Since the first of the 22-strong fleet of aircraft was delivered to the Oxfordshire station on November 17, 2014, the Atlas has repeatedly proven itself on a range of operations.

The aircraft excelled during relief operations in the Caribbean and contributed fully to the military response to COVID-19, transporting patients, equipment and vaccines. It played a pivotal role in the evacuation of entitled personnel from Afghanistan and Sudan, and most recently delivered supplies by air drop in Gaza.

Operated by four squadrons at RAF Brize Norton, an Atlas is also based in the Falkland Islands providing maritime reconnaissance, search and rescue, and medical evacuation cover in the South Atlantic. With the benefit of air-air refuelling, Atlas can also airdrop supplies in Antarctica.

Last year an RAF Atlas carried out the longest-ever flight of the type flying non-stop for 22 hours from RAF Brize Norton to Guam in the Pacific.

Commander Air Wing, Gp Capt Andrew McIntyre said: “The Atlas has consistently demonstrated superior strategic capabilities and versatility for the many challenging missions faced by the RAF. Its range, altitude, speed, payload and tactical performance has proven invaluable in humanitarian missions over the past ten years, including the Caribbean, Afghanistan, Sudan, Middle East, not to mention protecting Europe’s Eastern flank and life-saving rescue missions in the South Atlantic.”

RAF Brize Norton celebrating the tenth anniversary of the A400M entering service *MOD/Crown Copyright*

New SPEAR missile fired for first time

THE UK Government announced on November 18 that the SPEAR air-to-surface cruise missile destined for the UK F-35B fleet was successfully fired from a BAE Typhoon FGR.4 test aircraft. A joint UK Ministry of Defence (MOD) and industry team conducted the first in a series of trials of the MBDA-designed SPEAR (Select Precision Effects At Range) missile from the BAE Systems-operated Typhoon test and evaluation jet at Vidsel range in Sweden. A statement said: “This guided firing marks a critical milestone in the development and maturity of the SPEAR programme, which is managed by the UK MOD’s Defence Equipment and Support.”

The Typhoon, ZK356 usually based at BAE’s facility at Warton. although it wears the marks of 41 Test and Evaluation Sqn based at RAF Coningsby, fired the new SPEAR next-generation turbojet-powered miniature cruise missile at Visdel weapons range.

The trial, which did not carry a live warhead, demonstrated the release, gather and long-range free-flight control of the missile following a high-altitude and high-speed release from the Typhoon aircraft. It also demonstrated the missile’s ability to autonomously navigate to its target via predefined waypoints, using its advanced all-weather radar seeker to map the target area, and then use seeker radiofrequency imagery to successfully engage with it.

This was the first time the MBDA manufactured missile, capable of hitting targets from 100km away, was fired from an aircraft. The RAF/Royal Navy F-35Bs will eventually be capable of carrying up to eight SPEAR missiles, providing the next generation of stand-off air-to-surface missiles for Suppression of Enemy Air Defences missions in challenging and complex operating environments.

Matthew Brown, SPEAR Team Leader at DE&S, said: “This trial was a key step on the way to delivering SPEAR to the UK frontline, where it will provide a new capability to defeat the most complex air defence systems, enabling pilots to fly and fight wherever they’re needed in defence of the UK and its allies.”

The Typhoon, ZK356, at Sweden’s Visdel weapons range where it fired the SPEAR missile *MOD/Crown Copyright*

Sweden opts for C-390 to replace Tp84s

SWEDISH AIR FORCE

An artist's rendition of a C-390 in Swedish markings above Gamla Stan, Stockholm *Embraer Defense & Security*

STOCKHOLM RECENTLY announced its decision to acquire an as-yet unspecified number of Brazilian-built C-390 Millennium multi-mission strategic airlifters from Embraer Defense & Security to replace its ageing fleet of KC/C-130H Hercules tactical transports, which first entered operational service as the Tp84 with the Swedish Air Force (SAF) in 1965.

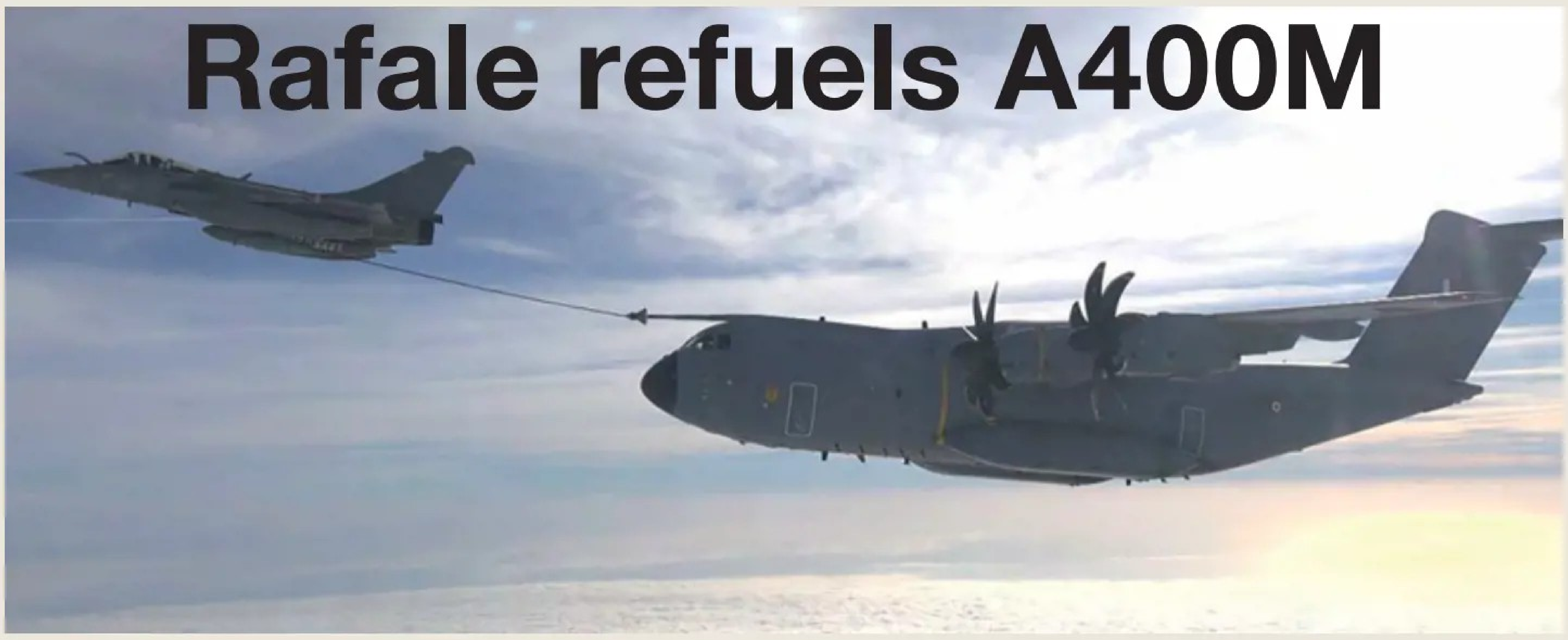
The decision was made on November 9, when the Swedish Defence Minister Pål Jonson signed a letter of intent (LOI) to purchase the C-390. Having now served for almost 60 years, Sweden's six-strong legacy Hercules fleet – which comprises five C-130Hs (Tp84) and one KC-130H (Tp84T) – are the oldest examples of the type still flying in Europe.

Sweden has become the latest nation to opt for the C-390 over the C-130J Super Hercules, which Lockheed Martin had teamed up with Swedish-based MilDef International AB to offer as the Tp84's replacement. With this move, the SwAF will become the eighth global operator and fifth NATO air arm to acquire the C-390 after Brazil, Portugal, Hungary, the Netherlands, Austria, South Korea and the Czech Republic. Details regarding the number of C-390s being acquired by Sweden, a delivery schedule and the overall contract cost have yet to be revealed.

The SwAF has been intent on replacing its Tp84s for some years. The service previously explored a move to acquire at least four second-hand C-130Js from the Italian Air Force, as the procurement of these airlifters was a preferred option to upgrade the older Tp84s. Ultimately, this deal fell through.

Confirmation of Sweden's selection of the C-390 comes as Brazil reveals its intention to acquire more F-39E/F Gripens from Swedish-based manufacturer, Saab. The two ongoing acquisitions will ultimately promote and strengthen defence ties and co-operation between the two nations.

Rafale refuels A400M



The French Directorate General of Armaments (DGA) shared an image on November 27 of a Naval Dassault Rafale M refuelling a French Air & Space Force A400M in an unusual coupling of buddy-to-buddy air-to-air (AAR) refuelling. The Rafale was using a new-generation pod to refuel the much larger aircraft. The test was to assess the pod for future use with the E-2D Hawkeye when it enters French Navy service. The A400M was selected as a surrogate aircraft due to similar speeds to the E-2D while refuelling. The E-2D will be operated in replacement to the E-2C which is not AAR-capable. *DGA*

Greece formalises UH-60M purchase

A Wisconsin National Guard 1st Battalion, 147th Aviation Regiment UH-60M Black Hawk – the same type that has been acquired by Greece
US Army/ Scott T Sturkol

ON OCTOBER 29, the US Department of Defense (DOD) awarded Sikorsky, a subsidiary of Lockheed Martin, a foreign military sales (FMS) contract to provide 35 UH-60M Black Hawk battlefield utility helicopters to Greece, writes Mark Broadbent.

The UH-60Ms are destined for the Hellenic Army and the deal includes training equipment, personnel training and an initial package of provisions to ensure a smooth transition of the helicopter into operational service. Athens signed a letter of offer and acceptance (LOA) in April 2024. The UH-60Ms will replace the ageing fleet of Bell UH-1H Iroquois 'Huey' utility helicopters, which entered operational service in 1969.

In a press release, Lockheed Martin said that Greece's Black Hawk acquisition will "significantly improve self-defence and bolster interoperability within the nation and with NATO allies." The firm noted that the Hellenic Army UH-60Ms will join other new equipment that it has delivered to the Greek armed forces, including new MH-60R and S-70B Seahawks and upgraded F-16V Block 70/72 Fighting Falcons and C-130B/H Hercules. Athens has also ordered 20 F-35A Lightning IIs from Lockheed Martin, with plans to increase this order to 40 airframes in the future.

The Hellenic Army's UH-60M fleet will join other derivatives of the Black Hawk already operational with other branches of the armed forces. Eleven S-70Bs are currently operated by the Hellenic Navy's 2nd Navy Helicopter Squadron (MEN) at HNHB Kotroni in the anti-submarine/surface warfare (ASW/ASuW) and search-and-rescue (SAR) role. Of these, eight examples are configured as S-70B-6 Aegean Hawks. The Hellenic Navy's 1 MEN at HNHB Elefsis has seven MH-60Rs that were acquired in 2021 to replace the unit's AB212ASW helicopters.

With both the MH-60R and S-70B already in Greek service, Lockheed Martin said the Hellenic Army's future UH-60Ms will "benefit from the operational and sustainment advantages of fleet commonality." Details regarding the cost and delivery of the Black Hawks to Greece were not disclosed.

B-52s simulate weapons drop in Finland

FIGHTER JETS from Finland and Sweden joined forces with two USAF B-52s to carry out a joint simulated attack over Finland for the first time ever on November 25.

Two Stratofortresses assigned to the 20th Expeditionary Bomb Squadron and operating from RAF Fairford conducted a simulated weapons drop training mission as part of Bomber Task Force 25-1 in Finland. During the mission bombers integrated with Finnish F/A-18C Hornets and Swedish Air Force Saab JAS 39 Gripens. The mission, codenamed Exercise Apex Jet, showcased Finland's growing role within the NATO alliance and marked another milestone in strengthening collective defence. The event also enabled US forces to learn from their Finnish counterparts, following austere landing demonstrations in September and participation in the Ramstein Air Base 1v1 air superiority exercise in June.

General James Hecker, commander of US Air Forces in Europe – Air Forces Africa, said: "This mission exemplifies our unwavering commitment to our European allies and partners. Together, we build stronger, more strategic relationships that reinforce security and stability across the region."

A B-52H Stratofortressfrom the 20th Expeditionary Bomb Squadron taxis at RAF Fairford prior to taking part in Exercise Apex Jet, November 25, 2024
USAF/Airman 1st Class Laiken King

Abraham Lincoln conducts joint drills with Cavour

An F/A-18E Super Hornet, attached to Strike Fighter Squadron (VFA) 151, conducts aerial refuelling with four Italian F-35B Lightning IIs, attached to ITS Cavour Carrier Strike Group US Navy

While preparing for its upcoming withdrawal from the US Fifth Fleet's area of responsibility (AOR) in the Middle East region, the US Navy's Nimitz-class carrier USS *Abraham Lincoln* (CVN-72), which is spearheading Carrier Strike Group 3 (CSG-3) or Abraham Lincoln Carrier Strike Group (ALCSG), conducted a multi-large deck event (MLDE) with the Italian Navy's flagship aircraft carrier ITS *Cavour* (550) on October 18.

This marks the second time the ALCSG has conducted an MLDE with *Cavour* and its CSG during its ongoing deployment to the US Fifth Fleet AOR, which falls under the wider umbrella of US Central Command (CENTCOM) and encompasses approximately 2.5 million square miles of ocean, covering the Arabian Gulf, Red Sea, Gulf of Oman and parts of the Indian Ocean, as well as key choke points at the Strait of Hormuz, Suez Canal and the Bab al-Mandeb Strait. *Abraham Lincoln* and its escort vessels previously integrated with *Cavour* and its accompanying warships in August, when the two strike groups carried out the first-ever MLDE between the two navies in the Indo-Pacific region.

This operation provided an opportunity for the more than 7,500 sailors and airmen of the CSGs to advance interoperability between the two NATO allies by conducting integrated planning and co-ordination, communications, cross-deck leadership exchanges, fast-roping drills and air defense exercises to strengthen combined maritime operations and overall combat readiness.

Commenting on the joint drill, Rear Admiral Adan Cruz, the officer commanding CSG-3 (ALCSG), said: "The opportunity to exercise our interoperability with our Cavour CSG counterparts for a second time in our deployment highlights our strategic advantage inherent to our network of strong alliances. We have seized every opportunity to fly and sail with our Italian counterparts, to deepen our combined operational capacity anywhere in international waters."

Second Slovenian Spartan flies

REPUBLIKA SLOVENIJA
02
L2-02
C.S.X. 62348

A Slovenian Leonardo C-27J Spartan, 'NG', coded 'L2-02' (c/n 207) wearing the experimental serial number C.S.X.62348, took to the skies on November 29, 2024, at the Italian manufacturer's Turin-Caselle main facility and flight test centre. The aircraft is part of a two-aircraft deal signed on November 17, 2021, to supply the Slovenian Ministry of Defence with a C-27J Spartan with additional equipment for aero-medical operations, training for crews and integrated logistic support for two years. Marco Rossi

Romania becomes 20th F-35 Alliance Member

Lockheed Martin announced today that the Government of Romania has confirmed its intent to procure 32 F-35 Lightning II aircraft. Romania signed a letter of offer and acceptance through a US Foreign Military Sale. The F-35 will augment Romania's current Lockheed Martin F-16AM/BM MLU Block 15 fleet. No dates for delivery or expected entry into service were mentioned in the LM press release.

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Nightwatch supports Biden's visit to South America

UNITED STATES Air Force E-4B Nightwatch, serial 75-0125, made a surprise visit to Curaçao on November 14th, 2024. It arrived from Offutt Air Force Base (AFB), Nebraska, USA, using the callsign GRIM 99. The aircraft was supporting US President Joe Biden's attendance at the Asia-Pacific Economic Cooperation (APEC) summit in Lima, Peru.

The Nightwatch deploys to nearby locations whenever the US President travels and is kept on alert status should an emergency occur or in case Air Force One becomes unavailable. Assigned to the 1st Airborne Command Control Squadron, the militarized 747-200 is one of four serving as the National Airborne Operations Center (NAOC) under the Air Force Global Strike Command, providing a survivable link to US forces in the event of the destruction of ground command and control centers. The E-4B's arrival was preceded by KC-135R serial 59-1506 (135th ARW, Iowa ANG), KC-135T serial 58-0084 (171st ARW, Pennsylvania ANG) and KC-135R serial 58-0027 (151st Wing, Utah ANG). Several USAF C-17A Globemaster III supported the detachment, transporting personnel and ground support equipment to augment the locally based 429th Expeditionary Operations Squadron (EOS). The E-4B departed Curaçao on November 17th, bound for Brasilia International Airport, Brazil, to support President Biden's next engagement at the G20 summit in Rio De Janeiro. The aircraft departed Brasilia for Offutt AFB on November 19 using the same callsign, GRIM 99. Built in the 1970s, the E-4B will be replaced around 2032 by the Survivable Airborne Operations Center (SAOC). The new aircraft, designated E-4C, will be built from ex-Korean Airlines Boeing 747-8 that will be modified by Sierra-Nevada Corporation. *Patrick Lalande*

UNITED STATES OF AMERICA
50125

Departing Curaçao International Airport's runway 11, GRIM99 heads off towards Brasília Air Force Base to support President Biden with his visit to the G20 summit
Patrick Lalande

Osan to bid farewell to 'Warthogs' in 2025

THE USAF is preparing to complete a significant phase of its modernisation strategy in South Korea in FY 2025, bringing specific changes to the 51st Fighter Wing (FW) at Osan Air Base, Pyeongtaek, South Korea, which will bid farewell to its 24-strong fleet of A-10C Thunderbolt II close air support (CAS) aircraft.

The move comes as the USAF continues its push to phase out its remaining 'Warthogs' by 2029, as the service continues introducing more upgraded fourth-generation fighters across its bases in the Indo-Pacific while enhancing its ability to better integrate with deployed fifth-generation combat aircraft in the region. According to the USAF, the move "seeks to ensure peace and stability in the Indo-Pacific region, including the Korean peninsula, through state-of-the-art aircraft", adding that it will bolster deterrence against North Korea and "represents a pivotal upgrade in [USAF] capabilities, reinforcing its commitment to maintaining an overwhelming force posture in the region and adapting to evolving global threats."

One of the key changes to come as a result of this process is the withdrawal of the A-10C from South Korea. Assigned to the 51st FW's 25th Fighter Squadron (FS) 'Assam Draggins', the Thunderbolt II has long been associated with Osan, but a phased withdrawal of the unit's 24 jets is now scheduled to begin in January 2025 and is expected to be completed by the end of the fiscal year. To replace the outgoing 'Warthogs', USAF F-16C/D Fighting Falcons assigned to the USAF's Seventh Air Force (Air Forces Korea) are currently undergoing a series of avionics upgrades to enhance the fighter's capabilities and increase both the survivability and accuracy of the South Korea-based 'Vipers'.

A US Air Force A-10C Thunderbolt II assigned to the 25th Fighter Squadron, at the Korea Flying Training 2024 event at Kunsan Air Base, Republic of Korea, April 26, 2024 *USAF/Staff Sgt. Jovan Banks*

This marks a shift towards integrating the USAF's next-generation combat aircraft – including the upgraded F-16C/Ds, F-35A Lightning II and F-15EX Eagle II – across the region in a bid to significantly increase operational effectiveness. The USAF states that the upgraded 'Vipers' will continue to deliver flexible combat capabilities, while the F-35A will use its advanced stealth capabilities to enhance situational awareness and strike precision. Meanwhile, the F-15EX – a number of which will be based at Kadena AB in Okinawa – will be used to enhance overall air-to-air/ground combat effectiveness.

F-35C makes combat debut over Yemen

OPERATING FROM the US Navy's Nimitz-class aircraft carrier, USS Abraham Lincoln (CVN-72), in the Red Sea and the Gulf of Aden, F-35C Lightning IIs assigned to the USMC's Marine Fighter Attack Squadron 314 (VMFA-314) 'Black Knights' marked the type's combat debut with strikes against Houthi-controlled weapon facilities in Yemen on November 9-10.

Embarked as part of the Carrier Air Wing 9 (CVW-9), the USMC-operated fifth-generation multi-role stealth fighters joined other combat air assets in targeting multiple weapons storage facilities in Houthi-controlled territories in Yemen for the first time. In a press briefing on November 13, Pentagon press secretary Maj Gen Pat Ryder confirmed these facilities "housed a variety of advanced conventional weapons used by the Iran-backed Houthis to target us and international military and civilian vessels navigating international waters in the Red Sea and Gulf of Aden."

This was the combat debut of the carrier variant of the Lightning II family, which was the last of the three models of the type (F-35A/B/C) to conduct such operations. The USMC conducted the Lightning II's first combat operation on September 27, 2018, when F-35Bs assigned to VMFA-211 'Wake Island Avengers' were used to strike insurgent targets in Kandahar, Afghanistan, from the Navy's Wasp-class amphibious assault ship, USS Essex (LHD-2), in the Persian Gulf.

The first combat employment of the F-35A fleet was on April 30, 2019, when two Lightning IIs assigned to the 388th Fighter Wing/419th Fighter Squadron at Hill AFB, Utah, conducted an airstrike on an ISIS tunnel network in Iraq while deployed at Al Dhafra Air Base, UAE, in support of Operation Inherent Resolve.

During the briefing on November 13, Ryder confirmed that the US Navy had successfully thwarted multiple retaliatory attacks by the Houthis on two Arleigh Burke-class guided-missile destroyers, USS Stockdale (DDG-106) and USS Spruance (DDG-111), as the two warships navigated through the Bab al-Mandab Strait on November 11. This attack involved at least three anti-ship cruise missiles, five anti-ship ballistic missiles and eight 'kamikaze' drones. Ryder confirmed that the attacks were "successfully engaged and defeated" with no damage to either vessel or reported personnel injuries. Meanwhile, the Houthis claimed they had successfully struck Abraham Lincoln, Stockdale and Spruance during the attack, but this was denied by the US.

An F-35C Lightning II, assigned to Marine Fighter Attack Squadron (VMFA) 314, launches from the USS Abraham Lincoln (CVN 72) *US Navy/Petty Officer 2nd Class Han Fiori-Puyu*

Vietnam receives Texan IIs

TEXTRON AVIATION Defense delivered five Beechcraft T-6C Texan II trainers to the Vietnam Air Defense Air Force at Phan Thiet Air Base in Binh Thuan Province, on November 20. Handed over during a formal ceremony, the Texan IIs, which were ordered under the US foreign military sales process in August 2022, are the first aircraft to be delivered to Vietnam since the US forces withdrew from the former Republic of Vietnam in 1975. The contract included ground support equipment, spare engines, parts, life support equipment, and technical support. After a multi-stop ferry flight that began at Beech Field in Wichita, Kansas on November 1, the trainers arrived at Tan Son Nhat International Airport in Ho Chi Minh City, Vietnam on November 18. Vietnam is the 13th international operator of the Texan II and initially contracted for three T-6Cs. It later increased its orders to include 12 and the remaining aircraft will be delivered by mid-2025. *Tom Kaminski*

604
N2770B
604
605

T-6C 604 and 605 taxi at Beech Field in Wichita, Kansas at the start of their delivery flight to Vietnam *Textron Aviation/Greg L. Davis*

Night Owls fly Reaper at Cherry Point

MARINE UNMANNED Aerial Vehicle Training Squadron VMUT-2, conducted its first MQ-9A Reaper flight at Marine Corps Air Station (MCAS) Cherry Point, North Carolina, on November 21, 2024. Previously designated as Marine Unmanned Aerial Vehicle Squadron VMU-2, it was tasked as an operational RQ-21A squadron until the 'Night Owls' transition as the MQ-9A Fleet Replacement Squadron (FRS) began in July 2023. Now serving as Reaper FRS, VMUT-2's primary mission is to train Marine Corps MQ-9 pilots and sensor operators before assignment to operational VMU squadrons across the Marine Corps. VMUT-2's first class of student MQ-9 pilots and sensor operators, is scheduled to begin in spring of 2025.

The Extended Range Block 5 MQ-9A is tasked as Marine Air-Ground Task Force (MAGTF) Unmanned Expeditionary (MUX) Medium-Altitude, High-Endurance (MALE) aircraft and provides intelligence, surveillance, reconnaissance and targeting capabilities for the MAGTF and joint force. Additionally, it can perform missions that include maritime domain awareness, airborne network extension, airborne early warning, and electronic support. VMUT-2 is a subordinate unit of the 2nd Marine Aircraft Wing's (MAW) Marine Aircraft Group MAG-14. *Tom Kaminski*

EZ
VMUT-2
690

MQ-9A BuNo 170690 operated by Marine Unmanned Aerial Vehicle Training Squadron VMUT-2 taxies at Marine Corps Air Station Cherry Point *USMC/CWO2 Akeel Austin*

Air Pirates receive Apache Guardian

THE UTAH Army National Guard's 1st Battalion, 211th Aviation Regiment received the first of 24 new AH-64E Apache Guardian helicopters on November 23, 2024, when the first group of four Apache Guardians arrived at the Army Aviation Support Facility at South Valley Regional Airport's in West Jordan. They were reportedly transferred from the 1st Battalion, 82nd Aviation Regiment at Fort Liberty, North Carolina, which will be acquiring the newest V6 variants of the AH-64E. The Army Guard battalion has operated the Apache since 1992, when the first AH-64As arrived. The 'Air Pirates' later transitioned to the AH-64D in October 2009 *Tom Kaminski*

Jayhawk sunset at Laughlin

THE LAST T-1A Jayhawk trainer assigned to the 86th Flying Training Squadron was due to depart from Laughlin AFB, Texas, on December 16 following a ceremony that marks the conclusion of operations by the 47th Flying Training Wing. The 80th FTW is one of four Air Education and Training Command (AETC) wings that had delivered the advanced phase of the USAF's specialized undergraduate pilot training for students selected to fly airlift or tanker aircraft. Operations at Joint Base San Antonia-Randolph concluded in July 2024. Reporting the 47th Operations Group at Laughlin, the 86th FTS had operated the T-1A from Laughlin since 1994. *Tom Kaminski*

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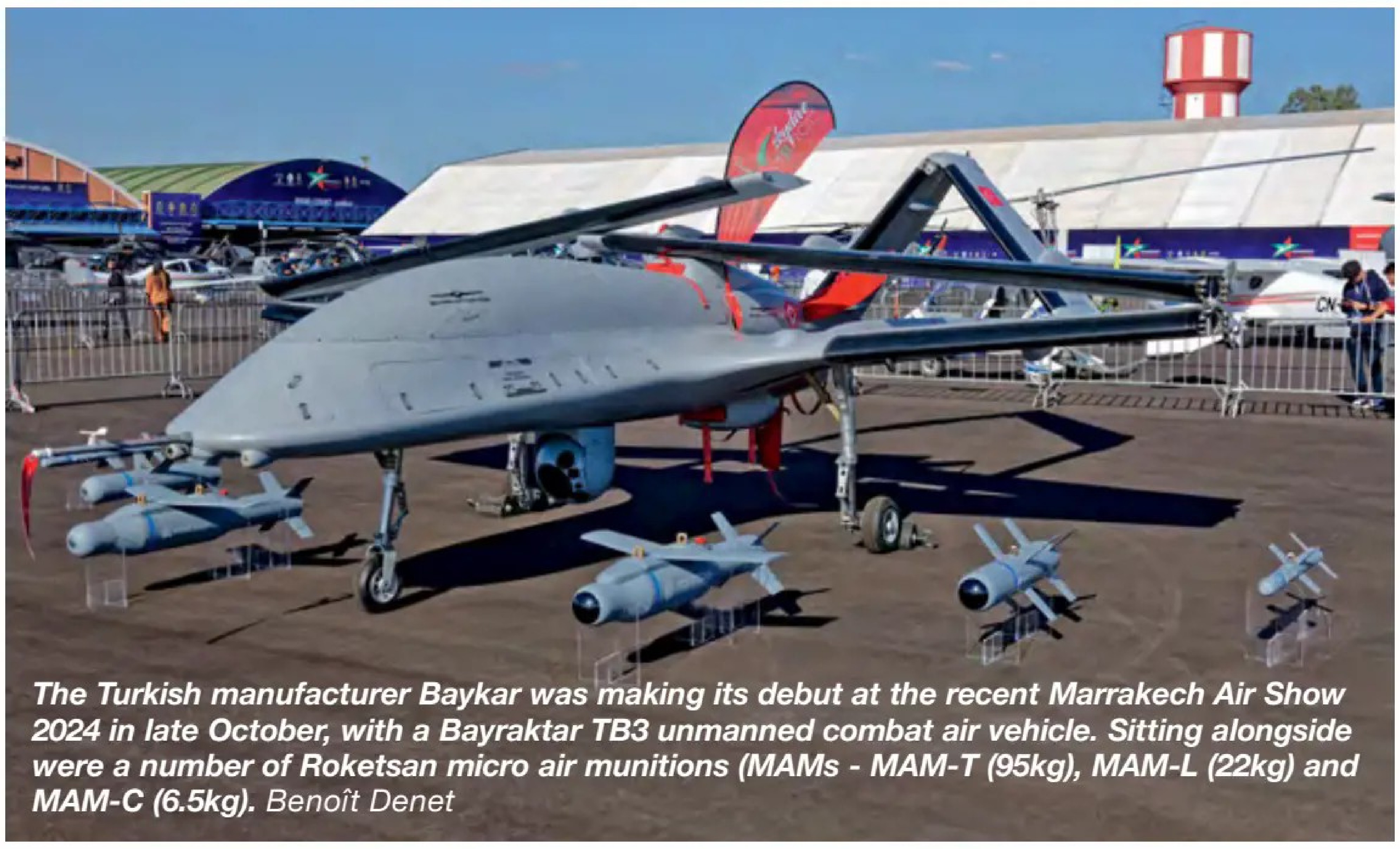
049/25

Morocco show: Bayraktar TB3



The Turkish manufacturer Baykar was making its debut at the recent Marrakech Air Show 2024 in late October, with a Bayraktar TB3 unmanned combat air vehicle. Sitting alongside were a number of Roketsan micro air munitions (MAMs - MAM-T (95kg), MAM-L (22kg) and MAM-C (6.5kg). Benoît Denet

Kenyan Army Z-9 returns after overhaul

ON OCTOBER 29, 2024, Commander Kenya Army Lt Gen David Tarus, presided over the commissioning of a newly refurbished Harbin Z-9 helicopter from China Aviation Technology Import and Export Corporation (CATIC) at the Kenya Army Corps of Aviation, Embakasi Garrison. The Z-9 helicopter, a utility military aircraft primarily designed for troop transport, represents an advanced tool in the Kenya Army's aviation arsenal.

First three Nigerian M-346s set for delivery in early 2025

The Nigerian Air Force (NAF) Chief of the Air Staff (CAS), AM Hasan Abubakar visited Leonardo in Italy in mid-October. His mission was to finalise arrangements on the acquisition of 24 M-346 trainer/ground attack fighters as well as an additional ten AW 109 Trekker helicopters to the two already on strength. During his stay he also inspected the first batch of six M-346 jets, with the three close to completion, expected to be delivered in early 2025, with subsequent deliveries running on until mid-2026. Meanwhile the additional ten AW 109s are expected to be delivered by early 2026. The CAS stressed the need for a maintenance hub in Nigeria to provide long-term support, especially for the M-346 fleet.

Capable of both air-to-air and air-to-ground missions, the NAF believe the M-346 will significantly strengthen Nigeria's air combat capabilities. While the AW 109s will bolster combat support roles such as Combat Search and Rescue (CSAR), tactical airlift and Medical Evacuation (MEDEVAC) among others.

NAF Chief meets Egyptian counterpart on Alphajets

THE NIGERIAN Air Force CAS, Air Marshal Hasan Abubakar, met his Egyptian counterpart, Lt Gen Mahmoud Foaad Abd El-Gawad in Cairo on September 4. Both pledged to enhance co-operation and collaboration between their respective air forces, particularly in pilot training and Research and Development (R&D).

Both commanders acknowledged the rich history of training collaboration between their air forces, and agreed this should be further leveraged. The NAF has previously benefited from the training of around 50 pilots by the Egyptian Air Force. They also explored opportunities for collaboration in R&D, particularly concerning the NAF's Alphajets. The EAF has agreed to send a delegation to Nigeria to assess the Alphajets, with the aim of the aircraft being overhauled by NAF engineers. The visiting team would also evaluate the possibility of conducting in-house tactical training for NAF pilots to enhance their proficiency.

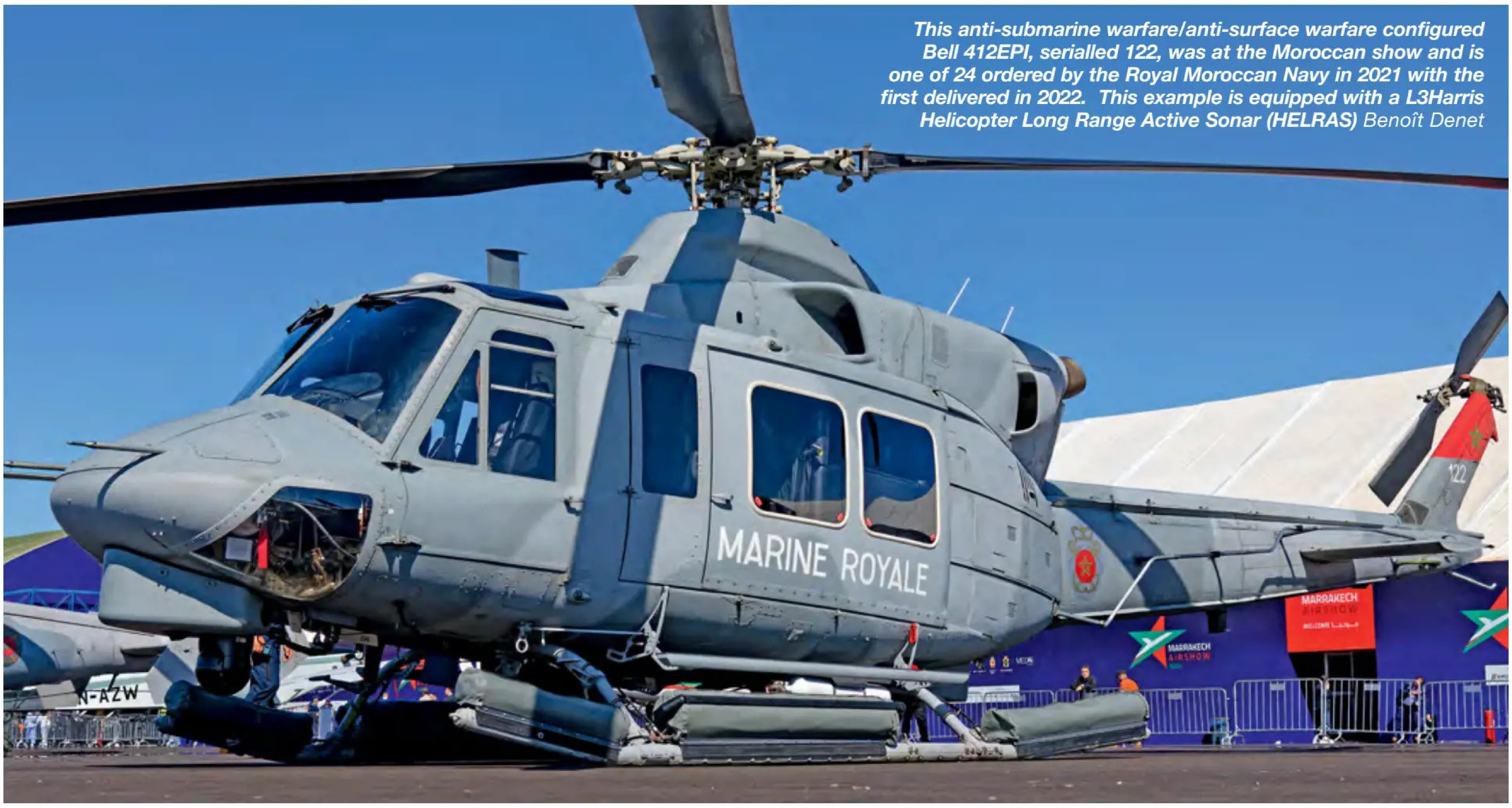
During the visit to Egypt, AM Abubakar also attended the Egypt International Air Show at El-Alamein International Airport (see November issue p22-24). He held discussions with Aero Vodochody Aerospace about the L-39NG, with CATIC, manufacturers of the Wing Loong unmanned aerial vehicle, and Ariegsa, an Egyptian company known for providing tailored simulation solutions for high-level needs and integrating defence and attack systems across diverse platforms. As a result, the NAF signed a Memorandum of Understanding with the company to construct a simulator for each aircraft type in the NAF. It was also agreed that the simulators would be built in Nigeria in collaboration with NAF engineers to facilitate knowledge transfer. Joining the CAS on the trip were the Director of Training, AVM Ahmed Idris, and the Commander of the 301 Heavy Airlift Group, Air Cdre Adebayo Bamidele.

NAF celebrates 10,000 hours on Super Tucano

The NAF celebrated 10,000 flight hours on the A-29 Super Tucano fleet on August 15, 2024. NAF CAS AM Hasan Abubakar expressed his delight that the milestone was achieved without any major incident on the aircraft

The Air Officer Commanding Air Training Command, AVM Nnamdi Ananaba noted the 10,000 flying hours translated into an average of approximately nine hours of daily flying time (or 270 hours monthly) for the past three years. Since its induction in August 2021, the A-29 has been involved in several big missions in the various operational theatres across the country. So far, over 8,500 hours flown on the fleet were dedicated to both day and night operational sorties against terrorists, bandits and other violent non-state actors threatening national peace.

Morocco show: Navy Bell 412EPI



This anti-submarine warfare/anti-surface warfare configured Bell 412EPI, serialled 122, was at the Moroccan show and is one of 24 ordered by the Royal Moroccan Navy in 2021 with the first delivered in 2022. This example is equipped with a L3Harris Helicopter Long Range Active Sonar (HELRAS) Benoît Denet

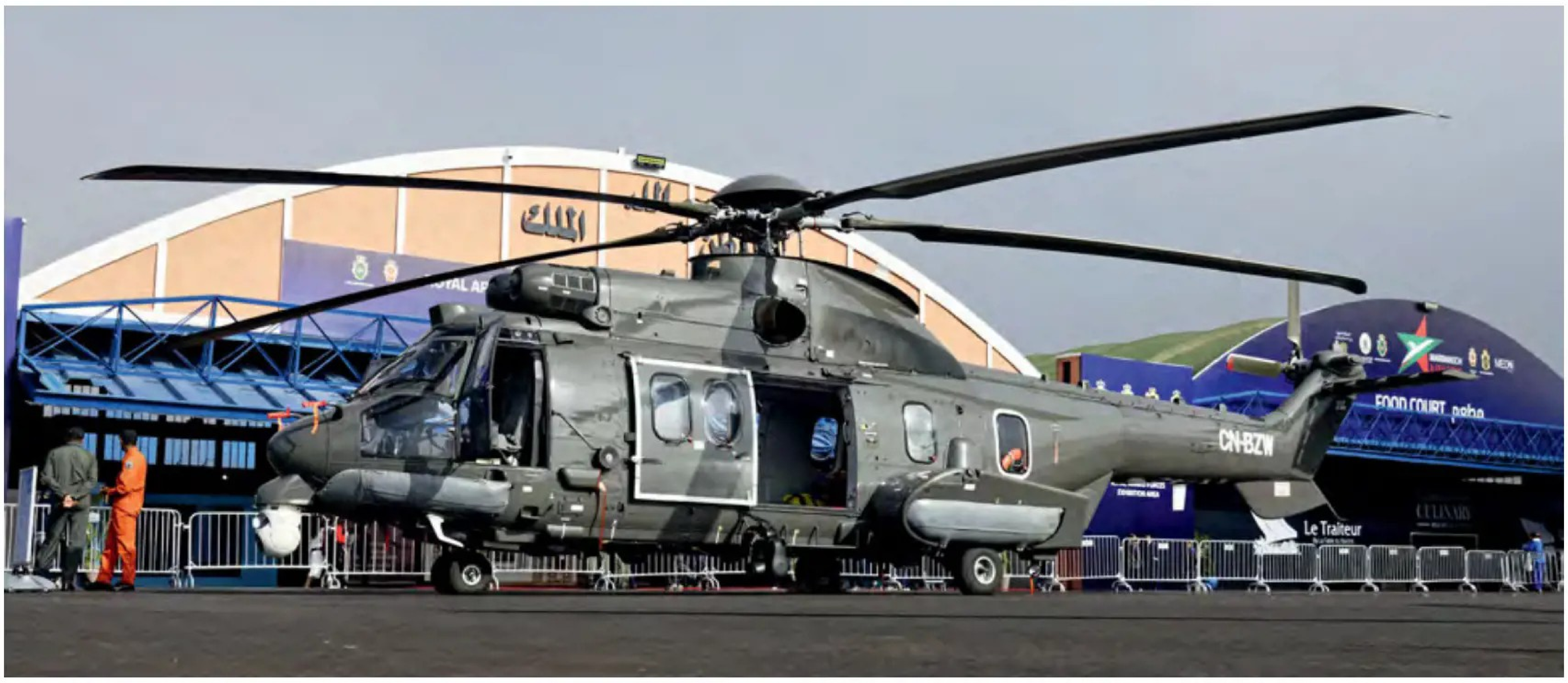
Nigerian AH-1Z deliveries imminent

THE NIGERIAN Air Force (NAF) has been assured the delivery dates for the AH-1Z attack helicopters remains on track. It came after the NAF's Chief of Policy and Plans, AVM Sayo Olatunde met with officials of the United States Government and Bell Textron in mid-July at NAF Headquarters. At the meeting, AVM Olatunde noted that the impending delivery of the AH-1Z attack helicopters will boost the NAF's close air support and ground attack capabilities while also enhancing its modernization efforts. The FMS deal worth $997m was confirmed in 2023 and deliveries should commence anytime soon.

Eight Hueys for Kenya Army

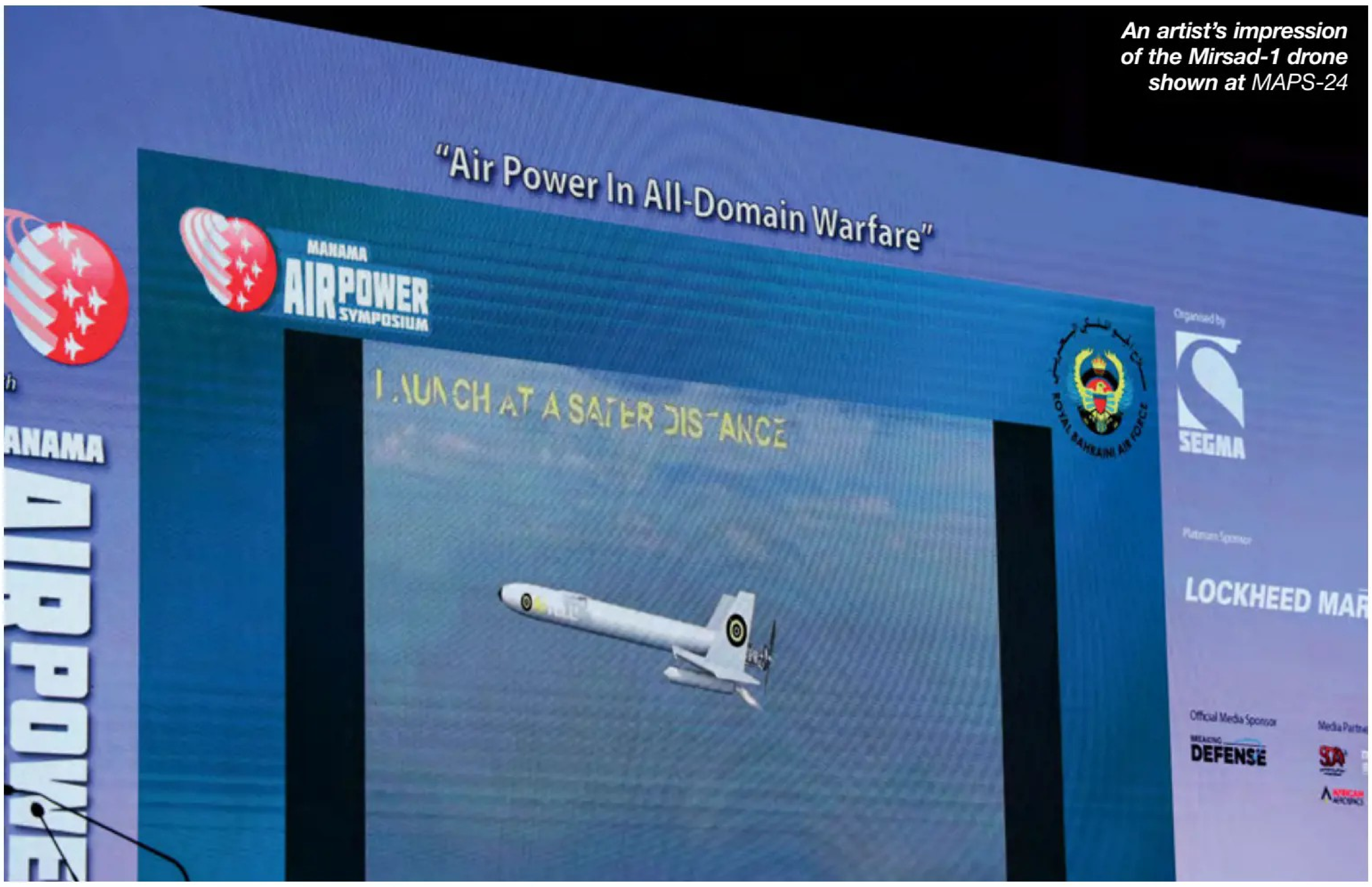
Two UH-1Y helicopters for the Kenyan Army Aviation were airfreighted in early July to the Embakasi Garrison in Nairobi, where they were subsequently assembled by US Air Force technicians. Six more Hueys were reportedly due to arrive by the end of August. The helicopters are set to perform counterterrorism and peacekeeping missions.

Morocco Show: Gendarmerie Super Puma



An Airbus EC-225LP Super Puma of the Moroccan Gendarmerie CN-MZW based in Rabat-Salé was also seen at Marrakesh. The helicopter was purchased second-hand, allowing the unit to increase its capacity, particularly during disasters and crisis management. Benoît Denet

Iranian Mirsad-1 UAVs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An artist's impression of the Mirsad-1 drone shown at MAPS-24

A TEAM from the Air and Missile Defence Command tasked to defend Bahrain's skies showed a video at the Manama Air Power Symposium on November 12, highlighting the issues of trying to defend its air space against Iranian drones. They provided an example of a single drone attack on an Israeli base that illustrated the threats that Bahrain faces. It occurred just a few miles from the southern Lebanon border, and killed four soldiers, injuring another 66. How could a $US20,000 drone evade Israel's $50m Iron Dome anti-missile battery system, they asked and then explained.

The drone, known as the Mirsad 1 by Hezbollah, was effectively one of 20 twin-tailed Ababils recently supplied by Iran. Constructed with a combination of plastic and steel components, it was lightweight and by ensuring stealth, reduced the radar signature and visibility. With a rocket assisted take off, the Mirsad 1 is being launched by militias from a safe distance, and with a forward looking infra-red camera, can send intelligence back to the militia commander. Just behind the camera is a warhead packed with TNT that can make a significant impact if used for offensive operations. During its flight to the target, the Mirsad-1 uses an Iranian-built four-cylinder MADO-550 engine. The presentation all helped to illustrate the threats that Bahrain and its GCC (Gulf Co-operation Council) allies face in this uncertain world.

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The TNT is located behind the camera

First of next two UAE A330s delivered

THE UNITED Arab Emirates (UAE) Air Force and Air Defence has received the first of two additional Airbus A330 Multi Role Tanker Transport (MRTT) aircraft at Al Ain Air Base, Abu Dhabi, according to an announcement by Airbus on November 13.

The UAE revealed their intention to order two additional A330 MRTTs at the Dubai Air Show in 2021, as well as an upgrade of the country's existing fleet of three A330 MRTTs to the latest enhanced version. Whether this includes the automatic air to air refuelling (A3R) system is unclear.

The first of the original fleet was delivered in early 2013 and was followed by the second and third aircraft by August 2013. With orders from 15 countries and more than 300,000 flight hours, the A330MRTT has a 90% market share and considered the world's most advanced tanker aircraft, although Boeing with its KC-46 would dispute that.

'Saudi Hawks' last Mk 65 international display

BIAS 24 marked the last international air show for the BAE Systems Hawk Mk 65s of the Royal Saudi Air Force's 'Saudi Hawks' display team. The seven jet trainers making up the team, built in the mid-1990s, made their debut display in January 1999, but are now set to be withdrawn from the show circuit. They are being replaced with newer more advanced Mk165s, assembled at the BAE Systems facility in Dhahran, in the desert kingdom. The aircraft will come from the second half of a batch of 22 that have been assembled locally and include a Head up Display built by AEC and a canopy built by Al Salam, companies that are now part of Saudi Arabia Military Industries (SAMI).

A ceremony to celebrate the last Hawk Mk165 coming off the Dhahran production line, took place at the World Defense Show in Riyadh last February, with one of the new aircraft displayed for the first time wearing the team's new style green and white colours. Understandably, it's a source of national pride that the Hawks set to fly with the team have been produced locally.

The last Mk 65 air show will take place in Riyadh before the end of the year (2024), and the pilots will commence training on the Mk 165s. As a result, the team will not fly in 2025 and will make its public debut at Riyadh's World Defense Show in February 2026.

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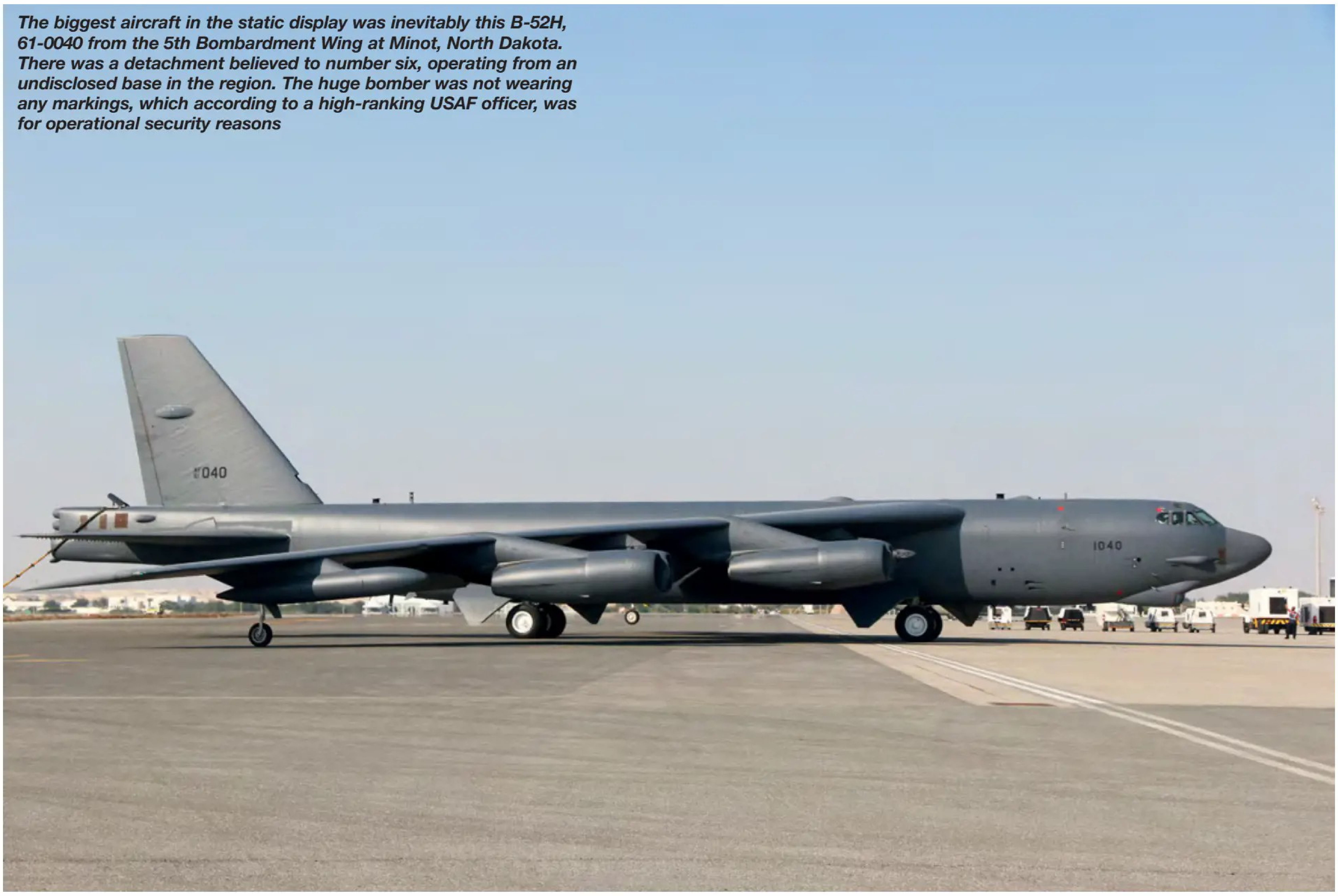
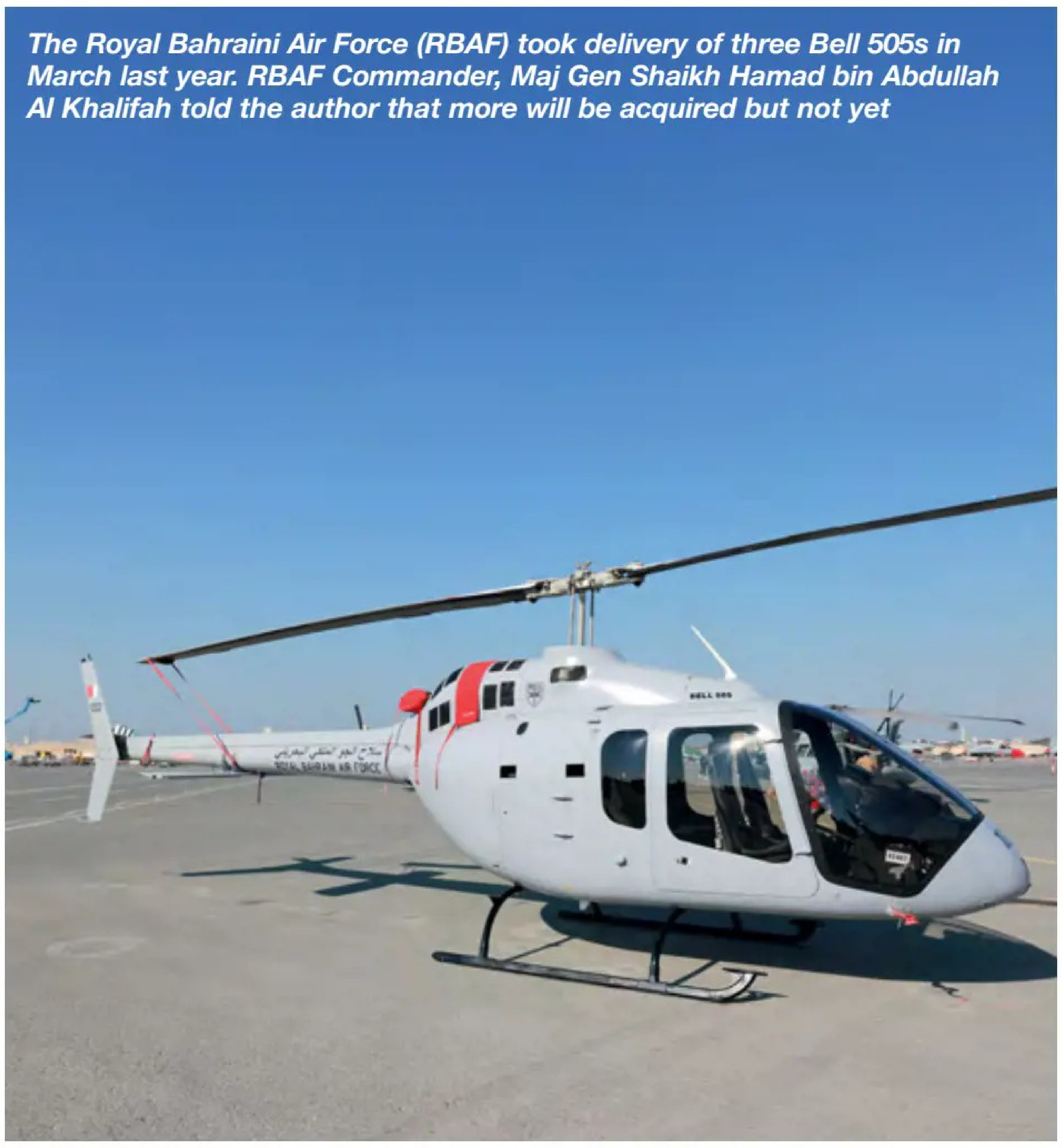
048/25

Middle East: Bahrain International Air Show

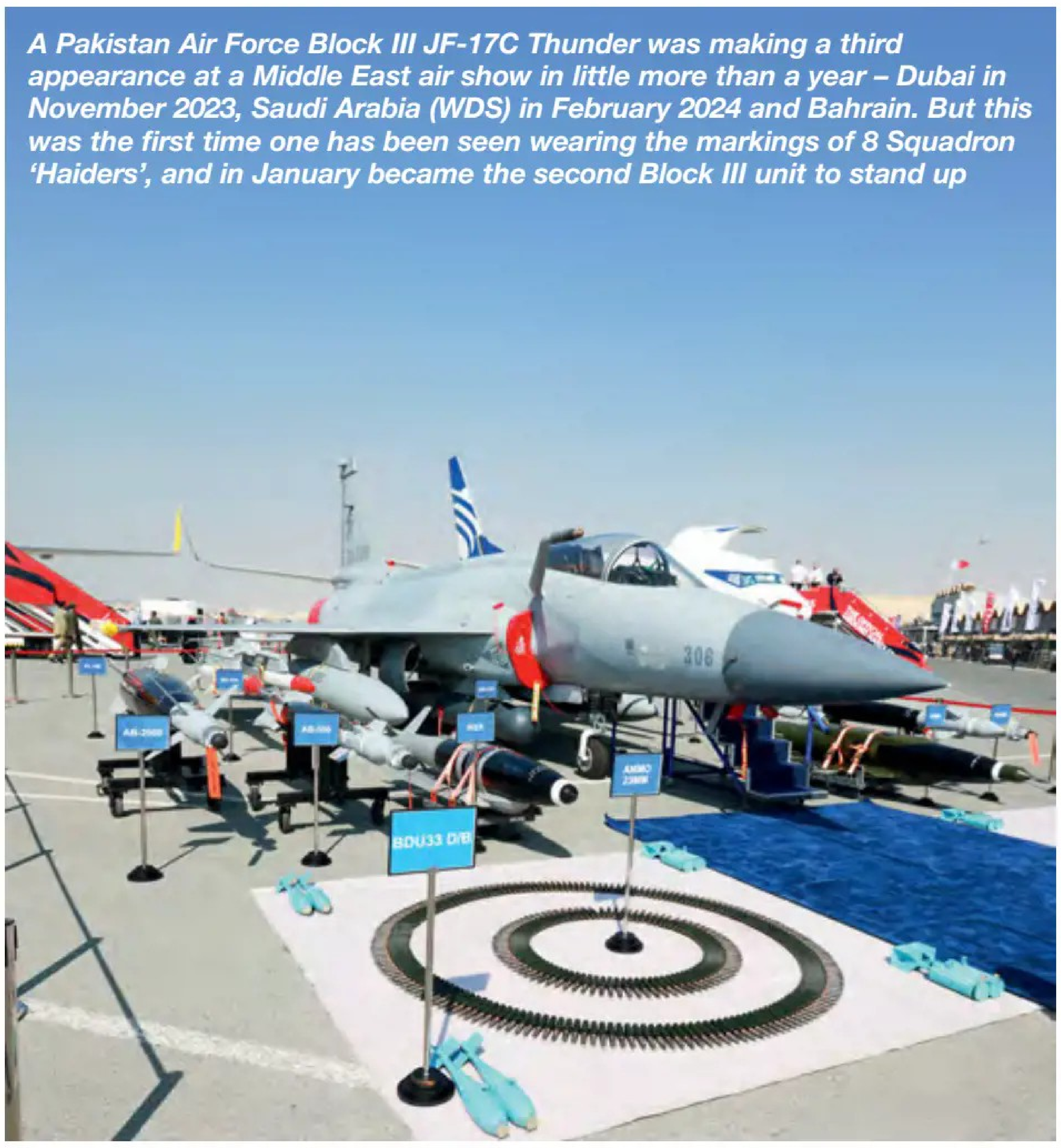
Alan Warnes attended BIAS 24 at Sakhir Air Base during November 13-15, to see both the very old and very new in the region



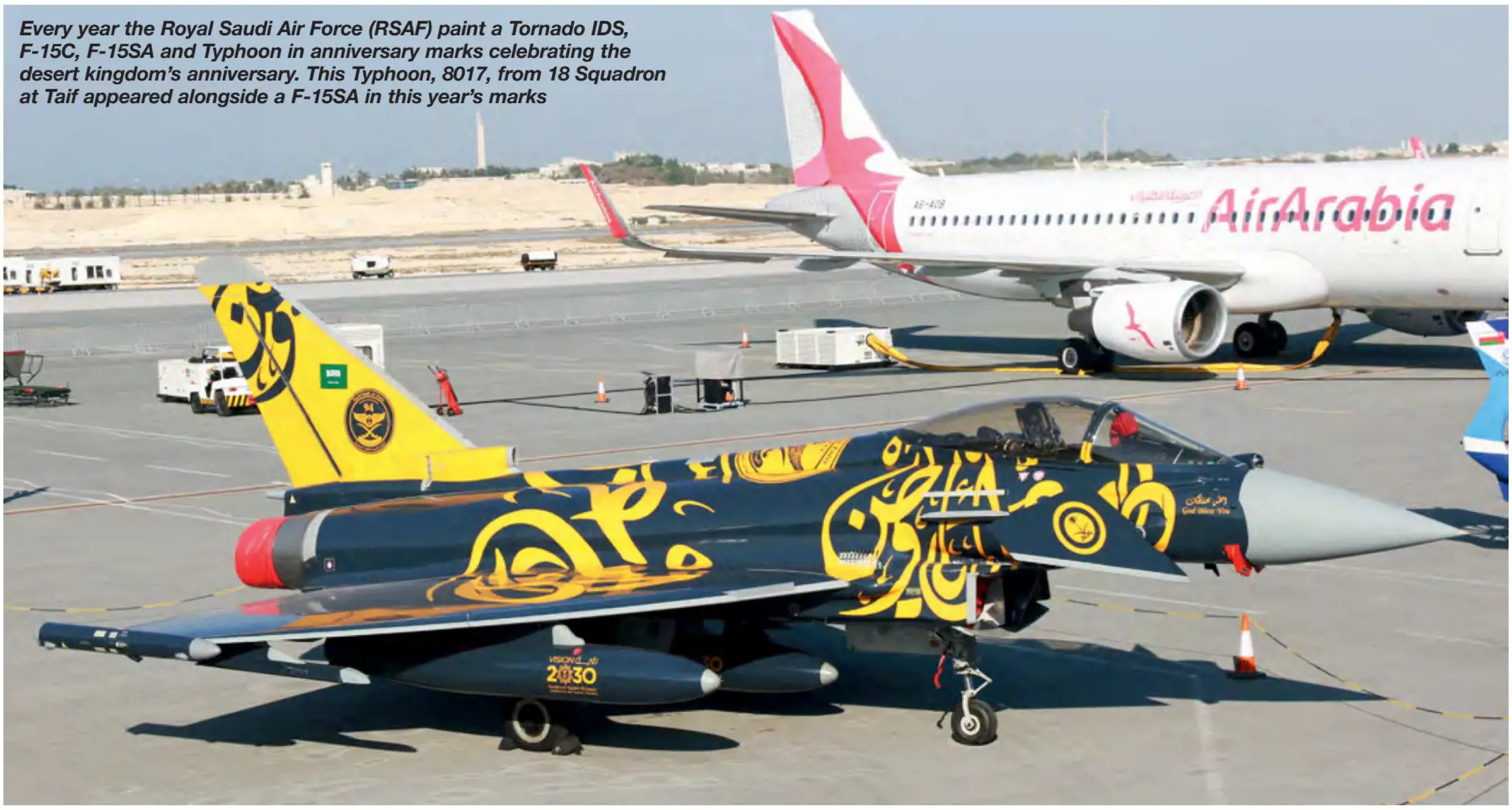
The biggest aircraft in the static display was inevitably this B-52H, 61-0040 from the 5th Bombardment Wing at Minot, North Dakota. There was a detachment believed to number six, operating from an undisclosed base in the region. The huge bomber was not wearing any markings, which according to a high-ranking USAF officer, was for operational security reasons



The Royal Bahraini Air Force (RBAF) took delivery of three Bell 505s in March last year. RBAF Commander, Maj Gen Shaikh Hamad bin Abdullah Al Khalifah told the author that more will be acquired but not yet



A Pakistan Air Force Block III JF-17C Thunder was making a third appearance at a Middle East air show in little more than a year – Dubai in November 2023, Saudi Arabia (WDS) in February 2024 and Bahrain. But this was the first time one has been seen wearing the markings of 8 Squadron 'Haiders', and in January became the second Block III unit to stand up



Every year the Royal Saudi Air Force (RSAF) paint a Tornado IDS, F-15C, F-15SA and Typhoon in anniversary marks celebrating the desert kingdom's anniversary. This Typhoon, 8017, from 18 Squadron at Taif appeared alongside a F-15SA in this year's marks

The RSAF's 'Saudi Hawks' aerobatic team of Hawk Mk 65s was making its last international display, before re-equipping with the newer Mk 165s assembled at Dhahran. The team will train on the new mount during 2025 and reappear at Riyadh's World Defense Show in February 2026. The team celebrated its 25th anniversary on the 15th – the last day of BIAS

A new AH-1Z Zulu, this one with just 27 hours on the airframe, appeared in the RBAF static display for the first time. They are operated by 19 Squadron, according to one of the aircrew, based at Riffa. All 12 of these highly capable attack helicopters were delivered in 2022

A C-17A Globemaster III of the 172nd Airlift Wing/ Mississippi ANG, 96-0007, taxies onto the apron with support equipment for the USAF static which included an A-10C, B-52H, C-130J and F-16CM. It departed before the show started

US approves E-7 sale to South Korea

An RAAF E-7A Wedgetail from No. 2 Squadron takes off from RAAF Base Darwin during Exercise Diamond Storm. Four similar Wedgetails might be requested by South Korea *Australian DOD/Cpl Craig Barrett*

US STATE Department approval has been granted for the proposed foreign military sale (FMS) of four E-7 Wedgetail airborne early warning and control (AEW&C) aircraft along with related equipment and services to South Korea which would have an estimated cost of $4.92bn. Confirmation of the sale was announced by the US Defense Security Cooperation Agency (DSCA) on November 4, after it had notified US Congress the same day.

Seoul is looking at possibly buying four E-7s to complement the Republic of Korea Air Force's (ROKAF's) existing fleet of four 737-7ES Peace Eye AEW&Cs, which entered operational service with the 271st Air Control Squadron at Gimhae Air Base in September 2011.

Seoul announced a competition to acquire more AEW&C aircraft to further expand the ROKAF's capabilities in late 2023.

While FMS approvals are not final, the Wedgetail faces competition from Sweden's Saab and its Global 6000-based GlobalEye swing-role surveillance aircraft and a solution proposed by US-based L3Harris, which has teamed up with South Korea's Korean Air and Israel's ELTA Systems on the project.

George Washington heads back to Japan with revamped CVW-5

Nimitz-class aircraft carrier USS George Washington (CVN 73) in the Pacific Ocean on November 6, 2024 *US Navy/ Mass Communication Specialist Seaman Geoffrey L Ottinger*

THE US Navy's Nimitz-class aircraft carrier USS *George Washington* (CVN-73), and its embarked, new-look Carrier Air Wing 5 (CVW-5) departed Naval Base San Diego, California, on October 8 to transit back to US Fleet Activities (USFA) Yokosuka, Japan.

George Washington will resume the role of the Navy's Forward-Deployed Naval Force-Japan (FDNF-J) carrier, replacing her sister ship, USS *Ronald Reagan* (CVN-76), which was charged with the mission at Yokosuka for nearly nine years before it departed Japan in May. This comes more than a year after *George Washington* completed its midlife refueling and complex overhaul (RCOH) at Newport News Shipbuilding, Virginia, in May 2023. After completing its required series of pre-deployment certifications and inspections over a ten-month period, the ship departed Naval Station Norfolk, Virginia, in April for its Southern Seas deployment around South America, arriving back in San Diego in July.

Having departed San Diego on October 8, *George Washington* was expected to arrive at Yokosuka in mid-to-late November, after a brief stop at MCAS Iwakuni in Japan's Yamaguchi Prefecture to offload its embarked aircraft from CVW-5. This marks the second time that *George Washington* has served in the FDNF-J role after it became the first nuclear-powered 'flattop' to be forward-deployed to Japan in 2008, before being relieved by *Ronald Reagan* in 2015.

Also returning to Japan after rejoining *George Washington* are the air units attached to CVW-5, which parted ways with the 'flattop' ahead of its RCOH in 2015. It has since received its own capability upgrade, with the addition of a diverse line-up of new air assets. This includes F-35C Lightning II fifth-generation multi-role stealth fighters of Strike Fighter Squadron 147 (VFA-147) 'Argonauts', E-2D Advanced Hawkeye airborne early warning and control (AEW&C) aircraft of Airborne Command and Control Squadron 125 (VAW-125) 'Tigertails' and CMV-22B Osprey carrier onboard delivery (COD) tiltrotors of Fleet Logistics Support Squadron 30 (VRM-30) Detachment 5 'Titans'.

While the 'Argonauts' will make history by becoming the US Navy's first forward-deployed F-35C squadron, it is not the first time the type has embarked aboard *George Washington*. The 'flattop' first operated with F-35Cs during its Southern Seas deployment earlier this year, enabling the crew to familiarise themselves with the carrier-based variant of the fifth-generation fighter.
Khalem Chapman

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Chinese surprises

Andreas Rupprecht appraises the fighters on display at the Zhuhai Airshow, an event that was full of surprises

The 2024 China International Aviation & Aerospace Exhibition – better known as the China or Zhuhai Airshow – took place from November 12 to 14, in Zhuhai, Guangdong province. This biennial event was eagerly awaited by aviation enthusiasts and analysts from all around the globe as well as the general public. They were not disappointed, as all the well-known Chinese manufacturers exhibited, and as is now customary, all three branches of the People's Liberation Army: the Army Aviation (PLA), Naval Aviation (PLAN NA) and the PLA Air Force (PLAAF) showed off their latest systems both in spectacular flight as well as extensive static displays. Foreign traders were also present, and a special focus was the Russian Air Force (VKS).

According to Chinese sources, almost 600,000 people visited the airshow, and contracts worth a total of over 280 billion yuan (almost US$39bn) were signed.

The Zhuhai Airshow is special because it is the only international airshow that takes place in mainland China, plus China tends to be reserved and secretive when it comes to military news. Plus, this event is usually used to publicise new equipment and often reveals major surprises.

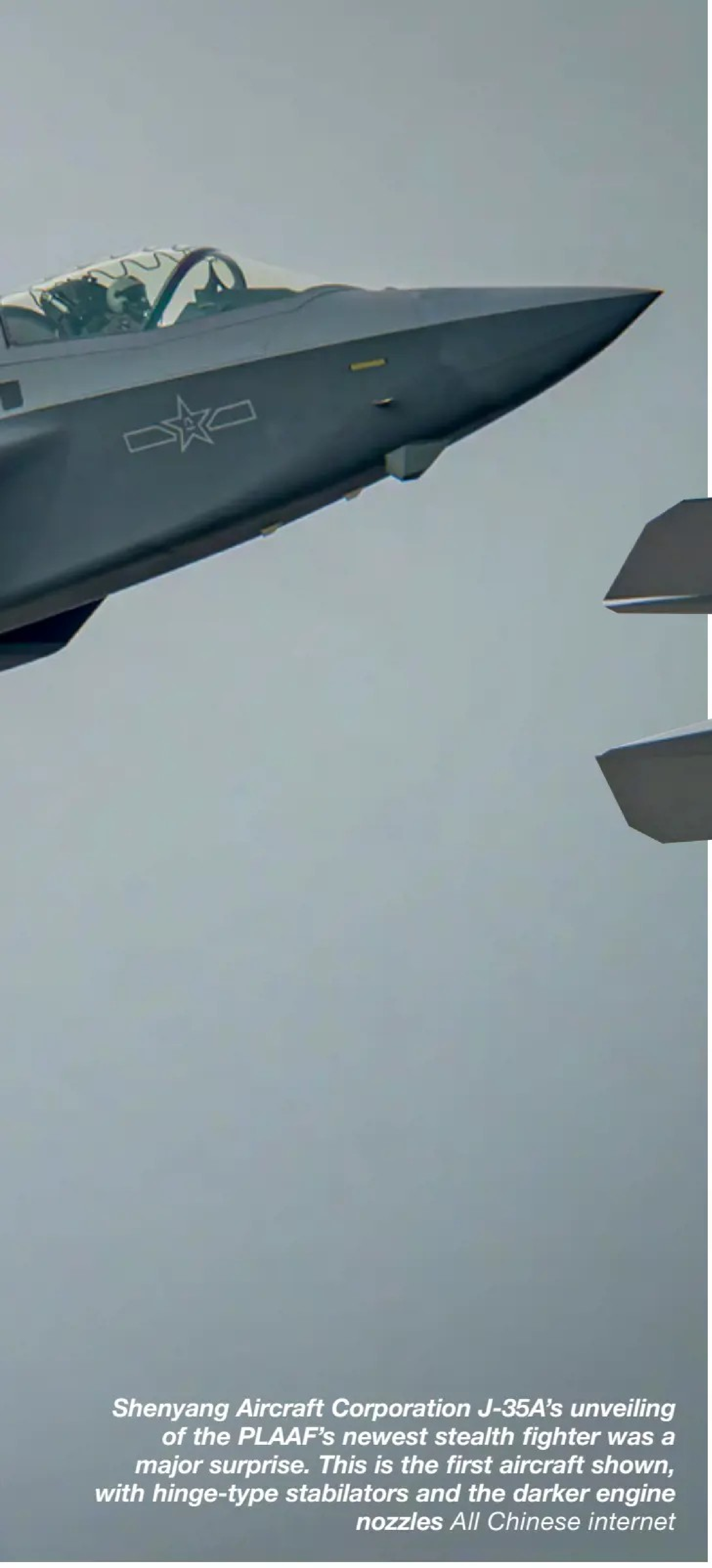
Shenyang J-35A – the 'Shining Dragon'

The undisputed star and in some ways the biggest surprise was the unveiling of the PLAAF's newest stealth fighter, Shenyang Aircraft Corporation (SAC) J-35A. Wearing a prominent '75' on its tails to commemorate the PLAAF's 75th anniversary, it wore only PLAAF markings but no visible numbers.

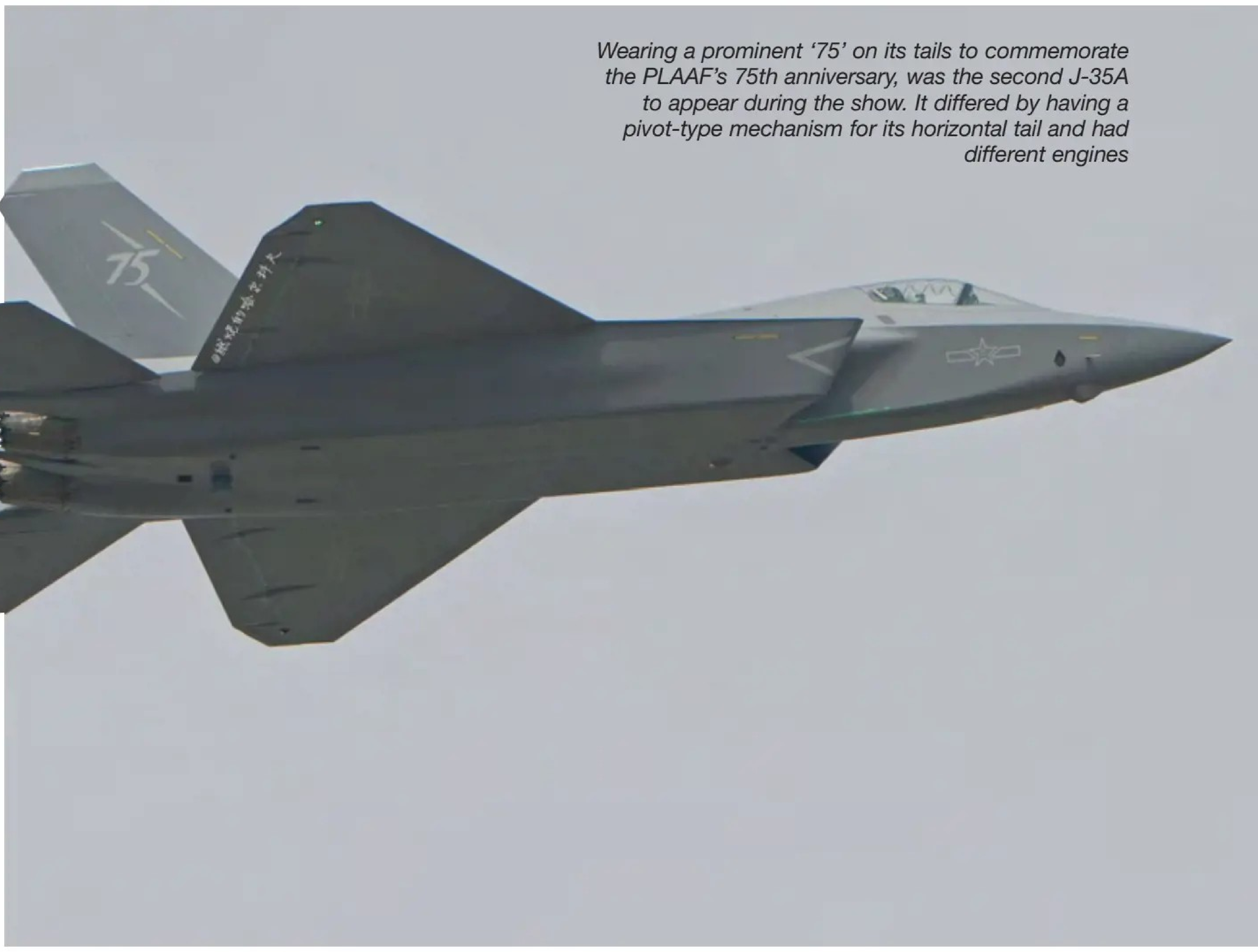
The J-35 is so far only officially known as the PLAN's new naval fighter for the new aircraft carrier *Fujian*. At least three, possibly two more, prototypes have been in testing since October 2022. At the show it was presented by the PLAAF rather than by AVIC or SAC. Consequently, it was confirmed what had only been rumoured for about a year based on blurry photos and social media reports. The PLAAF is not only actively involved in the J-35 program but will allegedly put the aircraft into service before PLAN NA. This means that the J-35A medium-sized stealth fighter – previously unofficially known as the J-31 – will officially become the second stealth fighter in PLAAF service as the 'Shining Dragon' (Yàolóng) after the J-20 'Mighty Dragon' (Wēilóng), a counterpart to the American F-35.

The J-35A evolved from SAC's private venture development and the very first demonstrator – then often referred to as the FC-31 (V1) – was shown at Zhuhai ten years ago. Initially the PLAAF was not particularly interested due to its preference for the Chengdu Aircraft Corporation's J-20 but over the years it slowly evolved via the FC-31 (V2) finally to the naval J-35. In fact, it was the first public appearance of that type and two clearly different prototypes were shown.

Since March 2021 it was rumoured that a dedicated land-based variant was being developed – initially expected to be an export variant – as the J-31 without arresting hook and folded wings with an overall smaller wing. In addition, it features a single-wheel nose gear and an EOTS (Electro-Optical Targeting System) underneath the nose and – like the J-20 – several small polygon-shaped EODAS (Electro-Optical Distributed Aperture System) windows around the fuselage. Allegedly, the prototypes are still powered by WS-21 turbofan engines, which are



Shenyang Aircraft Corporation J-35A's unveiling of the PLAAF's newest stealth fighter was a major surprise. This is the first aircraft shown, with hinge-type stabilators and the darker engine nozzles *All Chinese internet*



Wearing a prominent '75' on its tails to commemorate the PLAAF's 75th anniversary, was the second J-35A to appear during the show. It differed by having a pivot-type mechanism for its horizontal tail and had different engines

improved WS-13 engines, before the WS-19 are ready.

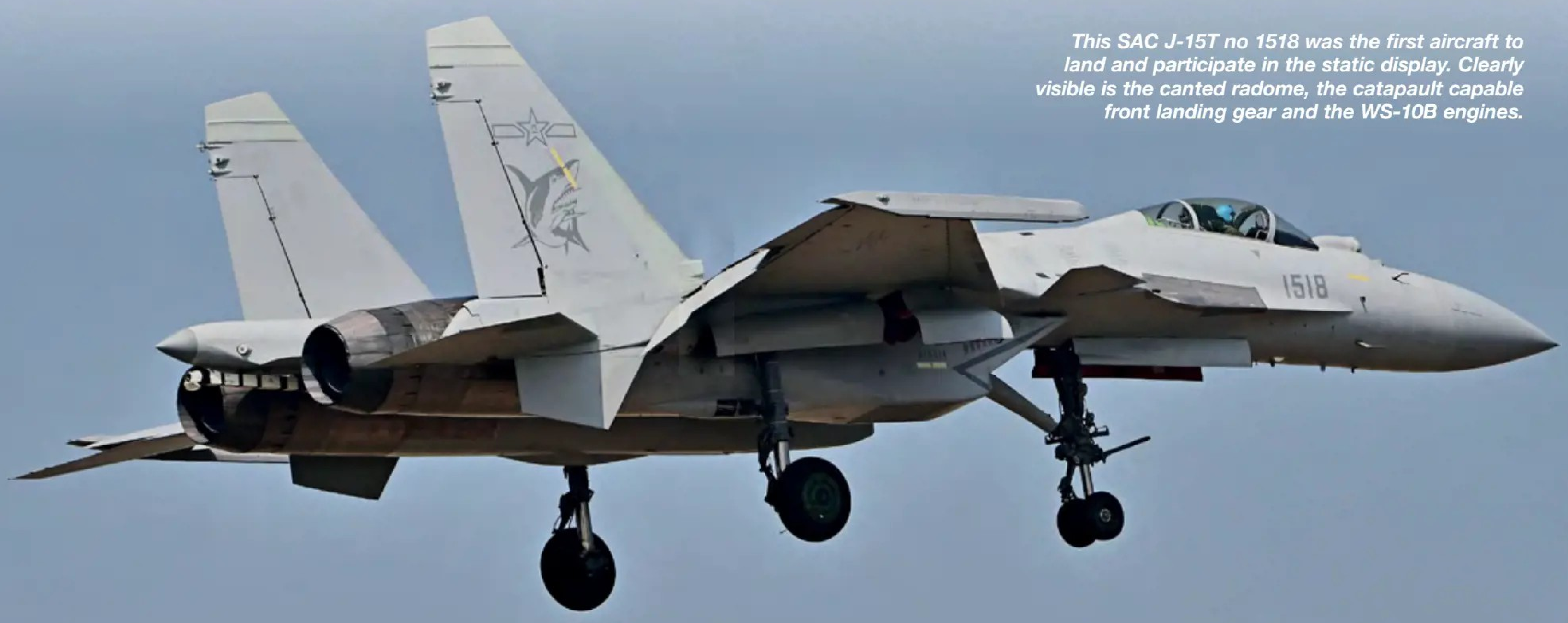
That secret program gained public attention, when in March 2022 an airframe was rumoured to have been transported to the 623 Institute for static tests. According to credible sources, the first J-35A prototype performed its maiden flight on September 26, 2023. At least three prototypes seem to currently be in testing and the two flown separately on different days of the 2024 Zhuhai Airshow differed not only in a redesigned mechanism to steer their stabilators/horizontal tails – one with a pivot-type while the second most likely later prototype a hinge-type mechanism but also in their exhausts. It wasn't clear if the new WS-19 was in use or the older WS-13E. The aircraft is rumoured to be entering service for operational evaluation (Opeval) with the PLAAF as soon as 2025, ahead of its naval counterpart, which remains in test.

Otherwise, there is currently lots of noise in certain forums, that the Pakistan Air Force is the first export customer for that type and will be getting them "soon". In the author's opinion any date before 2028 – aka after OPEVAL was concluded and it entered PLAAF service in a frontline unit – would be more than surprising. On the other hand, an export variant could, for the first time, be a 5th generation fighter in addition to the US F-35. So, with the flying display consisting only of a single flyby with afterburner, followed by an unrestricted climb to exit, it was not possible to draw a conclusion, but time will tell.

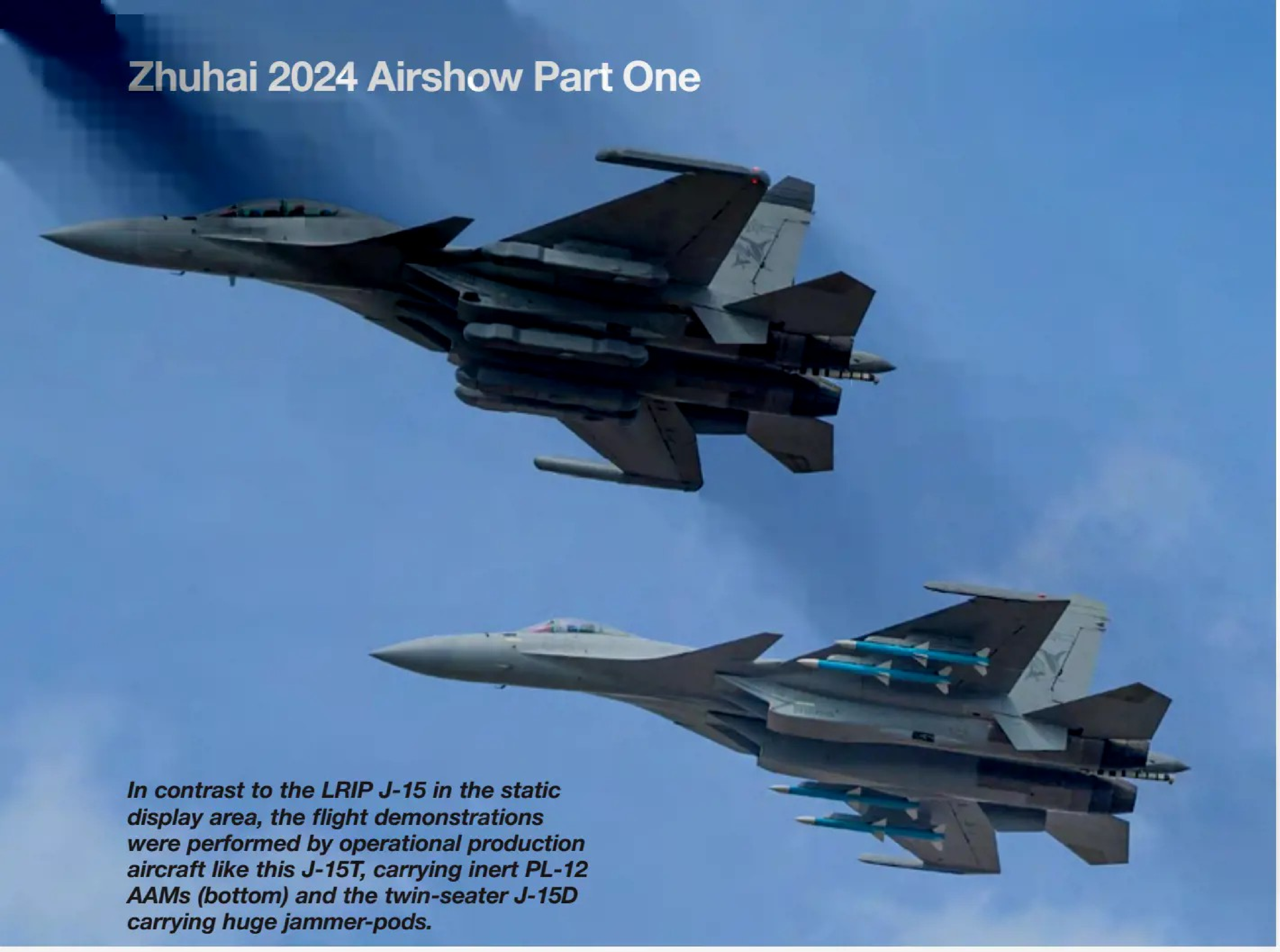
Catapult-capable Shenyang J-15T and J-15D electronic warfare variant

The second major surprise was the participation of the PLAN Naval Aviation – itself a first at any Zhuhai Airshow – and their unveiling of two important fighter types, namely the J-15T catapult-capable variant and J-15D electronic warfare variant.

The unveiling of the J-15T – so far unofficially known as the J-15B – was long awaited. A few days prior to the show, the PLAN leaked some impressive images showing both the CV-16 *Liaoning* and CV-17 Shandong in dual-carrier



This SAC J-15T no 1518 was the first aircraft to land and participate in the static display. Clearly visible is the canted radome, the catapult capable front landing gear and the WS-10B engines.



In contrast to the LRIP J-15 in the static display area, the flight demonstrations were performed by operational production aircraft like this J-15T, carrying inert PL-12 AAMs (bottom) and the twin-seater J-15D carrying huge jammer-pods.

operations, including a fly-by of at least 13 J-15s and 19 more on deck of both aircraft carriers. The PLAN officially confirmed the J-15s in service as the J-15T.

Known as a demonstrator since July 2016 – then based on the original J-15 airframe – the original J-15T was used to exhibit catapult capabilities. The serial variant is set to become the CV-18 *Fujian* aircraft carrier's most important fighter until the J-35 becomes available by the late 2020s. In 2021 it became clear this type had again been modified dramatically. Besides its strengthened front landing gear, there was the addition of a new AESA-radar in a canted radome, as well as other changes related to its avionics and cockpit. The LRIP-aircraft (low-rate initial production) are all configured this way, including the one shown at Zhuhai in the static display area, numbered 1518. This aircraft is unique, since it uses WS-10B engines unlike all other the operational aircraft seen so far which still rely on Russian AL-31F engines. Why the J-15 is the only Chinese *Flanker* variant that still relies on the Russian engine is not clear. Some reports suggest that the WS-10 engine is less resilient to saltwater than the Russian engine. However, it has also been reported that it was always the intention to install that engine and integrate them into future production blocks while all the delivered ones are likely be re-engined. That a WS-10-powered J-15T was seen at the show is a sign of growing confidence in this indigenous engine.

Even if the J-15T is to be stationed onboard the new Type 003 aircraft carrier, it has already become operational on both STOBAR (short take-off, barrier-arrested recovery) carriers and according to some analysis, around 30 are currently operational, forming a most capable force onboard the two legacy aircraft carriers. Adding to the revelation of operational J-15Ts onboard the two current carriers, and the appearance of the next important naval variant – the J-15D electronic warfare variant.

The J-15D has been known about since late 2016 and is based on the J-15S twin-seater as well as the PLAAF J-16D EW-version. It carries similar huge wingtip ESM/ELINT pods, has its windshield IRST/LR removed and features a different AESA-radar in a slightly different radome. Besides several more conformal antennas dotted all over the aircraft, it also carries four large EW//jammer-pods of the new RKZ-930 series.

Also expected to enter service "soon", the two aircraft shown at Zhuhai are in service with PLAN Naval Aviation onboard the two STOBAR carriers *Liaoning* and *Shandong* and consequently it is expected that there will also be a CATOBAR (catapult-assisted take-off but arrested recovery)-capable variant in the future for the *Fujian*. As such, the two D-series types J-15D and J-16D are aimed for SEAD/DEAD to neutralise enemy radar and communication systems to accompany the regular J-15 and J-16 multirole fighters similar to the EA-18G Growler in US Navy service and have no direct Russian equivalent.

During the flying display two J-15T were shown – one acting as a tanker – and one J-15D. The other PLAAF J-16 versions were seemingly neglected, even if a J-16D could be inspected in the static display, while the regular J-16 demonstrated its impressive agility in the flying display.

Other Flankers… J-16 & J-16D, plus Russian originals

At previous shows visitors were excited about the J-16 and J-16D – the two latest naval-variants are perhaps most capable members of China's prolific *Flanker* family. This year they took a back seat, even if both versions of the PLAAF were present with a large array of both air-to-air and air-to-ground weaponry. Based on the legacy Su-30MKK and totally indigenised with an AESA radar and powered by Chinese WS-10B engines, the J-16 impressively showcased China's advancements in avionics, materials and weaponry as well a departure from the once original Russian airframe.

The J-16 is a well-known guest at the Zhuhai Airshow and this year an aircraft from the 99th Air Brigade was shown

The J-16D was unveiled at the Zhuhai Airshow 2022 but this time an operational aircraft from the 26th Air Brigade appeared

The Russian Air Force Russian Knights demonstration team, with their original Russian *Flankers,* returned to Zhuhai after an eight-year hiatus. The team's single Su-30SM and six Su-35S fighters flew an impressive 35-minute-long performance. The Su-35S – unlike its Chinese counterparts – is fitted with thrust-vectoring engines, raising the bar for manoeuvrability and formation aerobatics. It was not just a demonstration of the type's agility and raw power but potentially more a political sign of underlining the historical collaboration between Russia and China in military aviation.

Russia's Su-57

Remarkably, the Sukhoi Su-57 was also present, both on the ground for the public to see up close, as well as in the air, marking that type's overseas debut. It sent a clear message about the close military co-operation between China and Russia, which was underlined by the visit of Sergei Shoigu, Russia's former defence minister who was in China for annual strategic security consultations. Officially, the Su-57 and Su-57E were present for promotion of the type to future export customers. Indeed, according to the Russian news agency TASS, a first contract was signed at Zhuhai for the Su-57E to as yet undisclosed customers.

Sergey Bogdan, often touted as Russia's best test pilot, left the crowd in awe at his Su-57 performance. It was a daily demonstration of "physics-defying agility" that included the famous Pugachev Cobra and the falling leaf manoeuvre.

While China demonstrated not just one but two fifth generation fighters, its J-35A and J-20 (more on the J-20 next month), Russia brought two Su-57s to Zhuhai, but the first was the 4th prototype, namely the T-50-4 '054 Blue' and not a production aircraft, and the second numbered '057 blue' was not even a real aircraft, but T-50-7, a static test airframe unable to fly which was ferried in via an An-124 Ruslan.

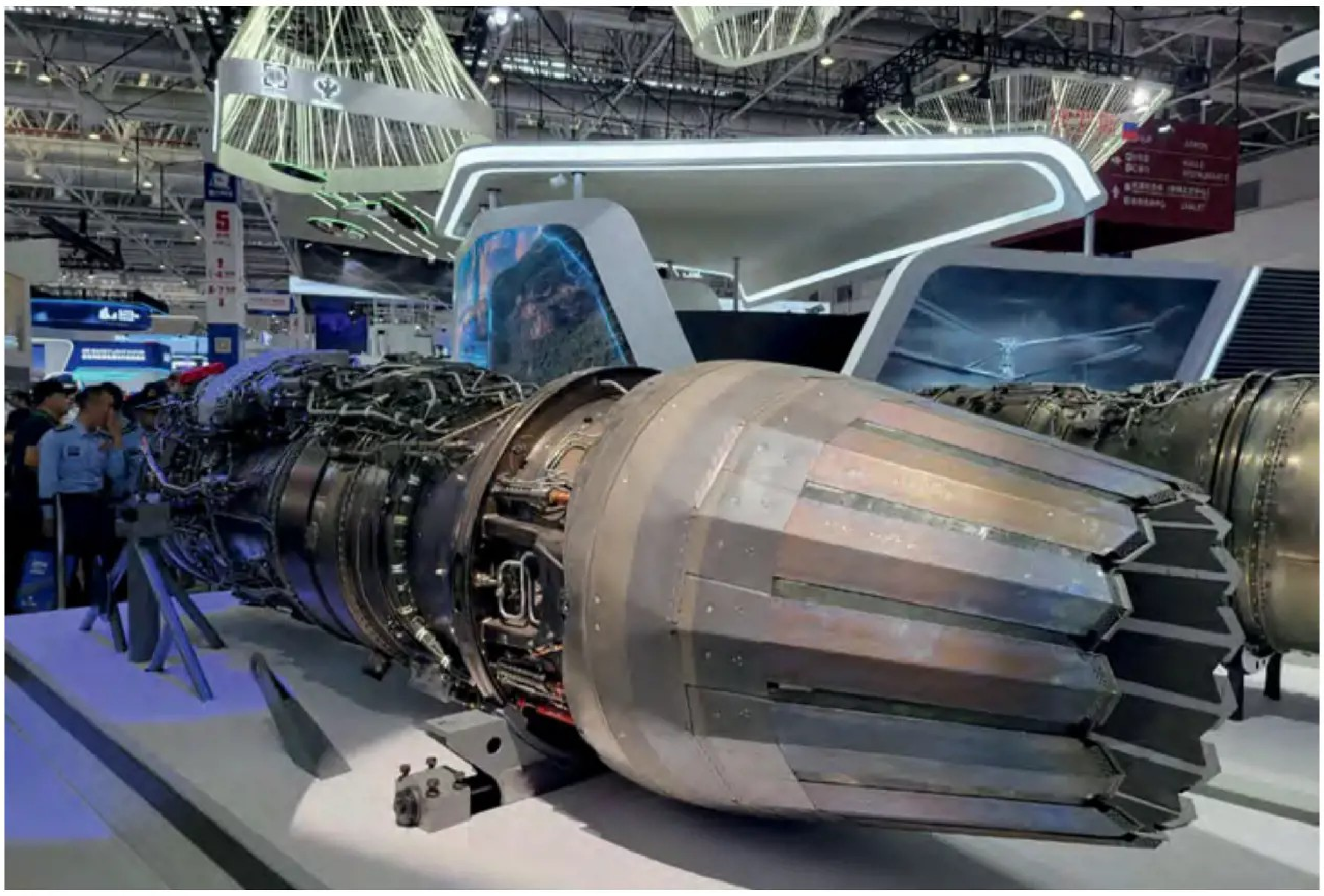
While it was great that spectators were able to take a look at the airframe, alongside some of the weapons designed for the aircraft, there was a lot of discussion on social media about "poor craftsmanship, mismatching panels and visible screw tops on the fuselage" inappropriate manufacturing quality for a 5th generation fighter, even if the so far secret side weapon bays of the Su-57 were shown open for the first time. Surely it represented an old early prototype and not the current production standard of serial Su-57s delivered to the Russian Air Force.

It left a strange taste, even more so when comparing it to the manufacturing quality of the latest Chinese fighters when the intention is to convince customers. And finally, another aspect that calls into question Russia's capabilities is the possible production capacity. Could Russia deliver Su-57s in sufficient numbers and if so, in what form? In recent years, the Russian Air Force has received no more than a dozen aircraft at best and the long-announced AL-51F engine is not yet ready. Even if everything can be explained, it raises some unanswered questions and leaves a rather tarnished impression of Russia's former capabilities.

A minor side-product of the Russian participation was the presentation of the 177S Fifth Generation Engine. Not to be confused with the Saturn AL-51F (Izdele 30) engine for the Su-57M, this engine is a development by the United Engine Corporation to replace existing Su-27/30 series AL-31F engines by offering an increased overall performance like a maximum thrust of 145kN and improved reliability (6,000 hours service life) as well as reducing fuel consumption in all operating modes.

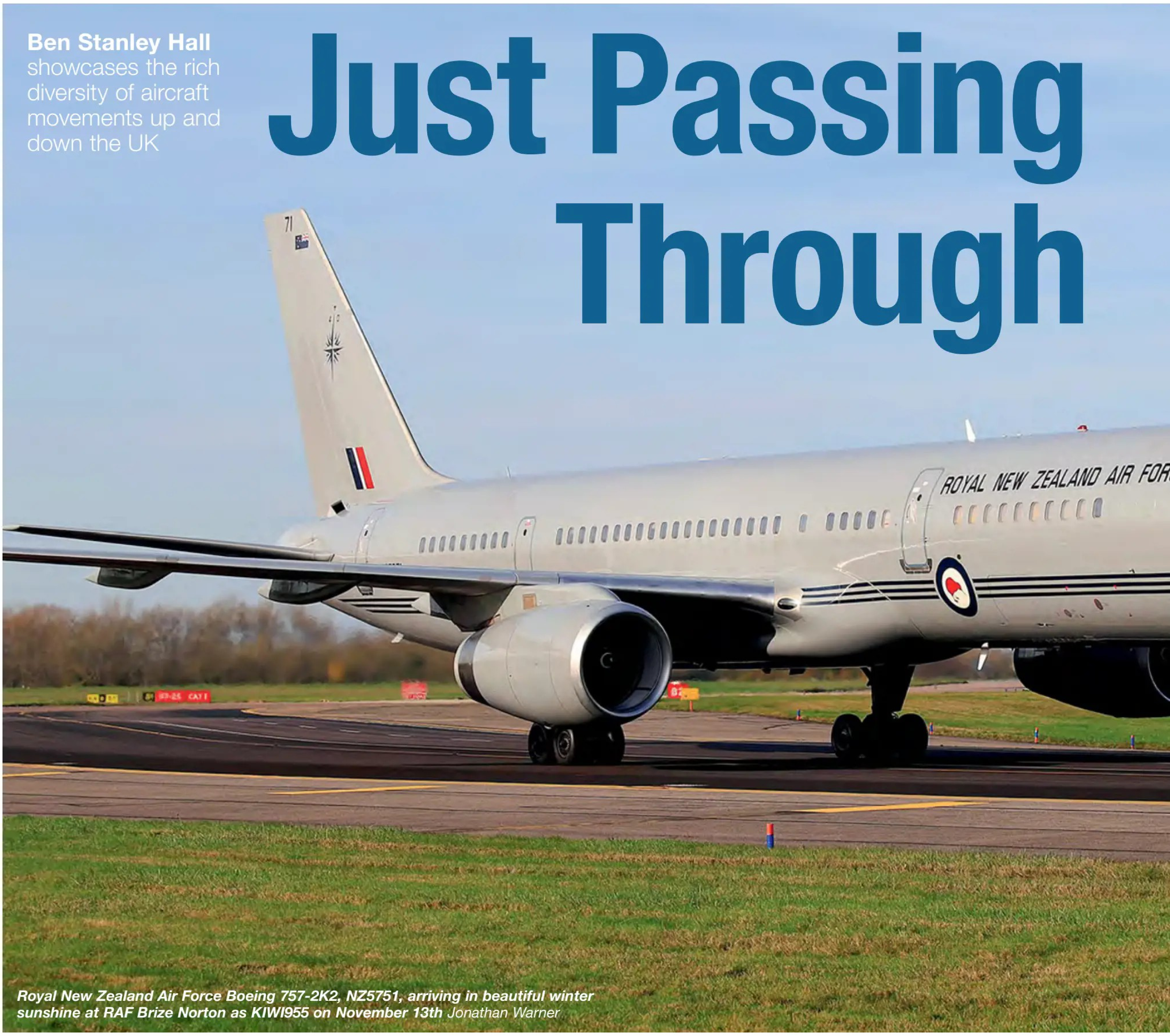
Next month: Chengdu J-20, plus a summary of other military aircraft and UAVs.

Sukhoi brought a Su-57 Felon to Zhuhai and Sergey Bogdan delivered an awesome flight program


Offered as a replacement for numerous older AL-31F-variants on Flanker versions, UAE unveiled its new 177S Fifth Generation Engine featuring a new stealthy nozzle and several improvements like higher thrust and a longer service life

Just Passing Through

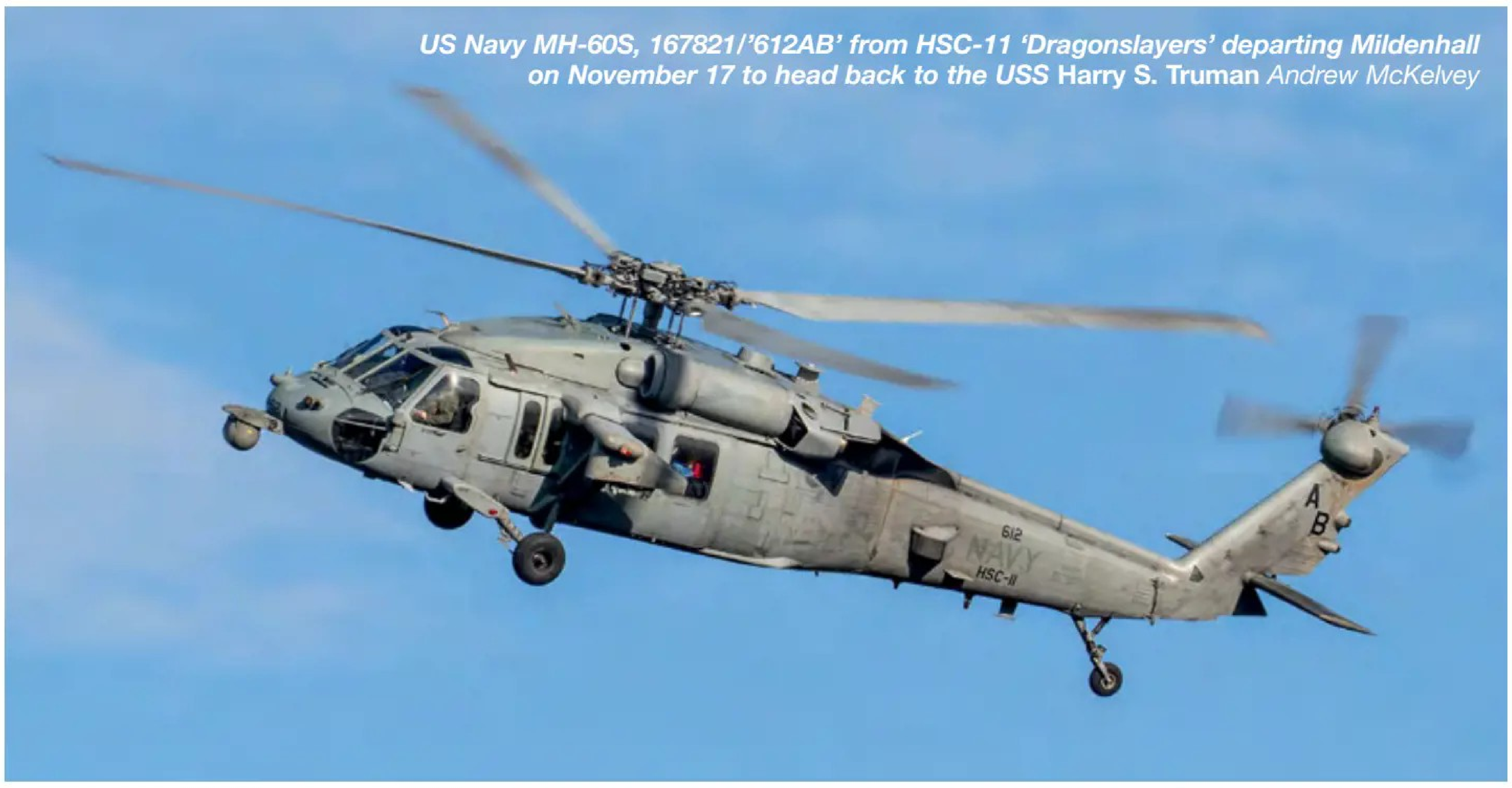
Ben Stanley Hall showcases the rich diversity of aircraft movements up and down the UK



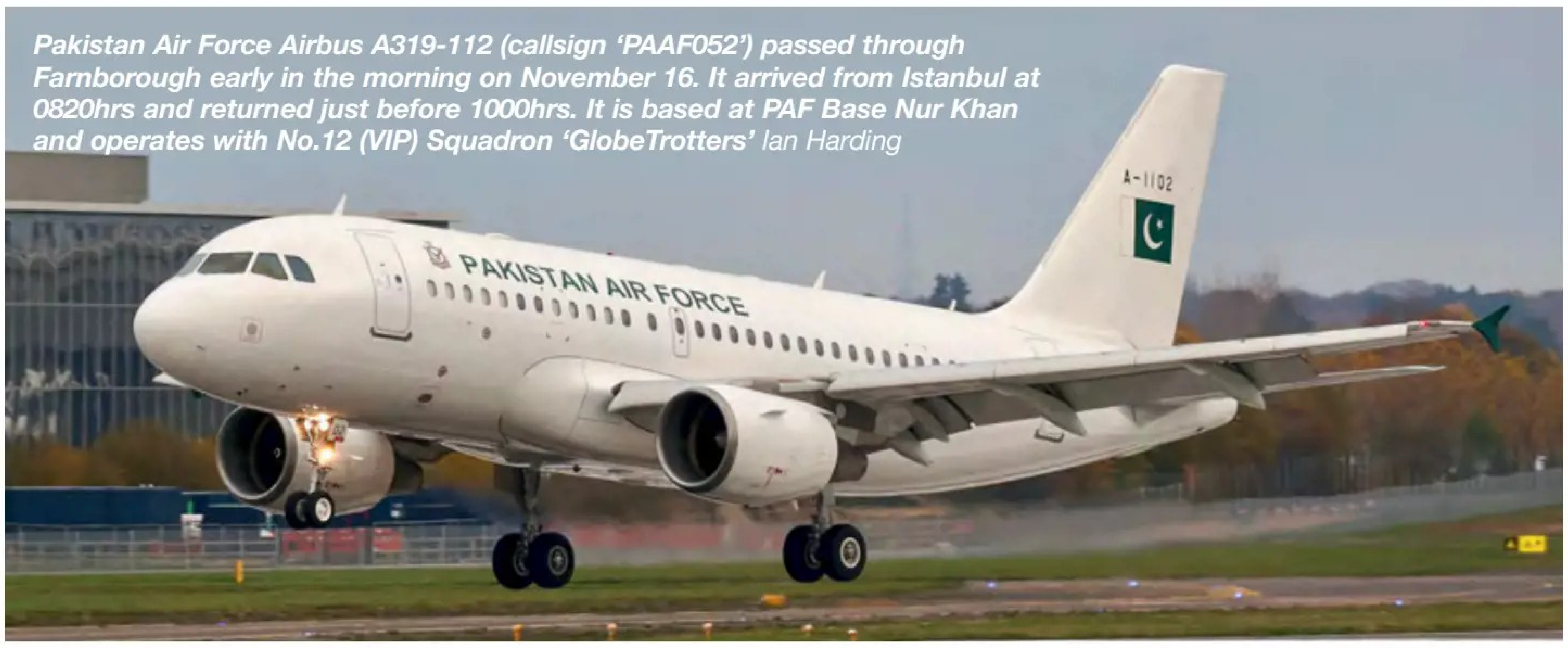
Royal New Zealand Air Force Boeing 757-2K2, NZ5751, arriving in beautiful winter sunshine at RAF Brize Norton as KIWI955 on November 13th *Jonathan Warner*

This month we have a wide variety of types, ranging from the diminutive Twin Otter, right up to the mighty C-17A Globemaster III. The variety doesn't stop with size; we also have airframes from as far afield as New Zealand, Hawaii and Pakistan.

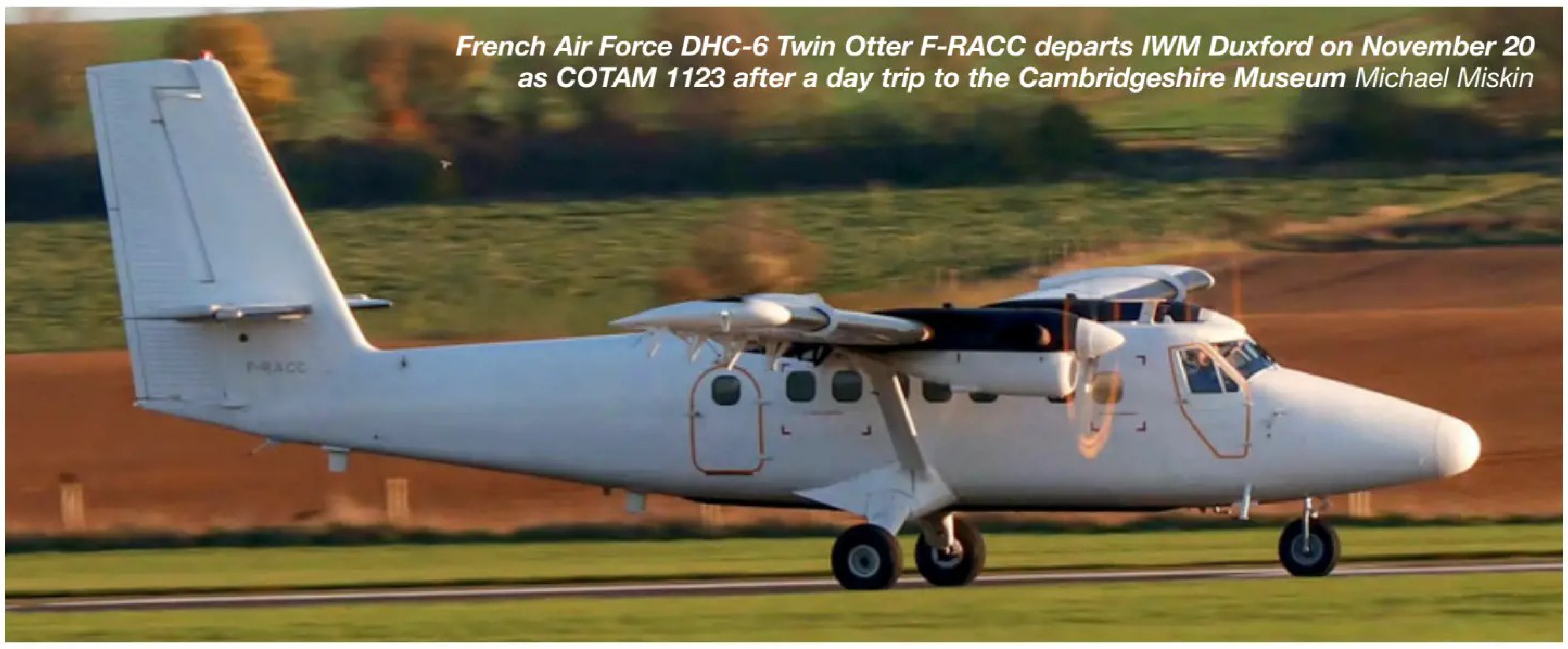
We welcome contributions from readers across the world. If you photograph an aircraft that is not in its usual location or could be of interest, please email your images, without watermarks, to ben.hall@keypublishing.com using the subject heading 'Just Passing Through', with a concise caption including as much information as possible. **afm**



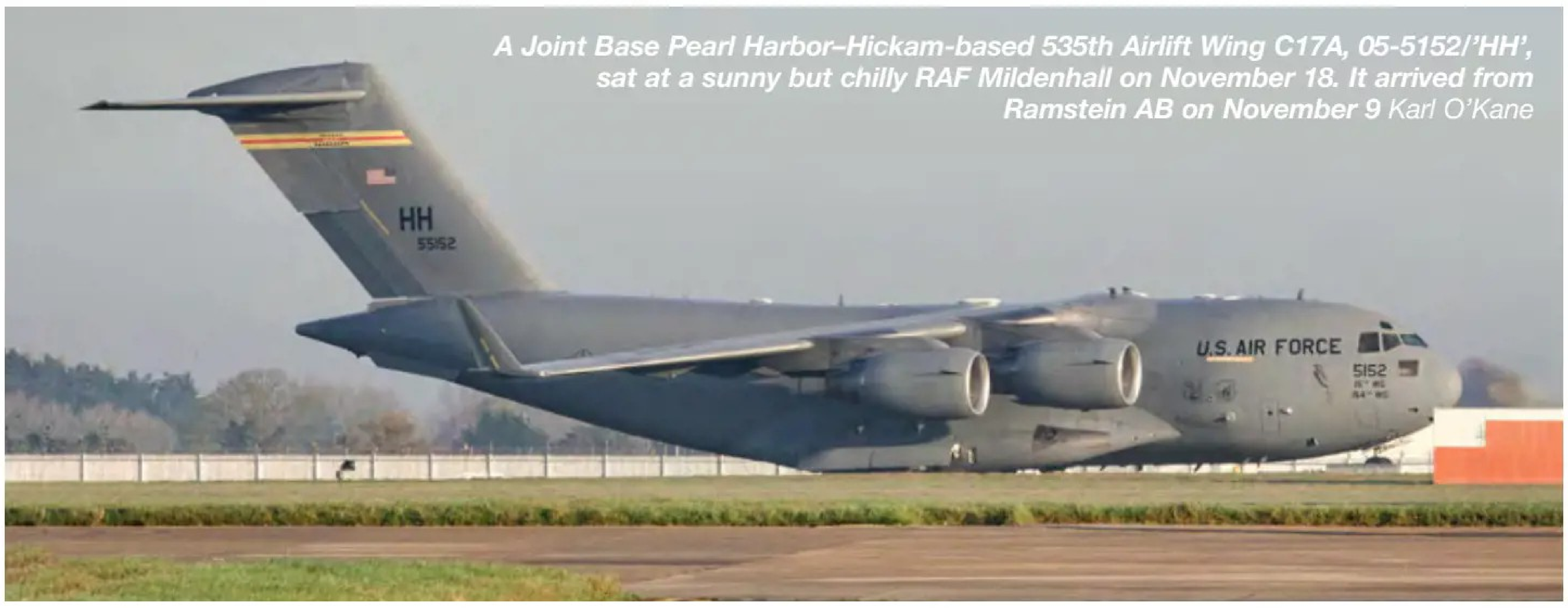
US Navy MH-60S, 167821/'612AB' from HSC-11 'Dragonslayers' departing Mildenhall on November 17 to head back to the USS Harry S. Truman *Andrew McKelvey*



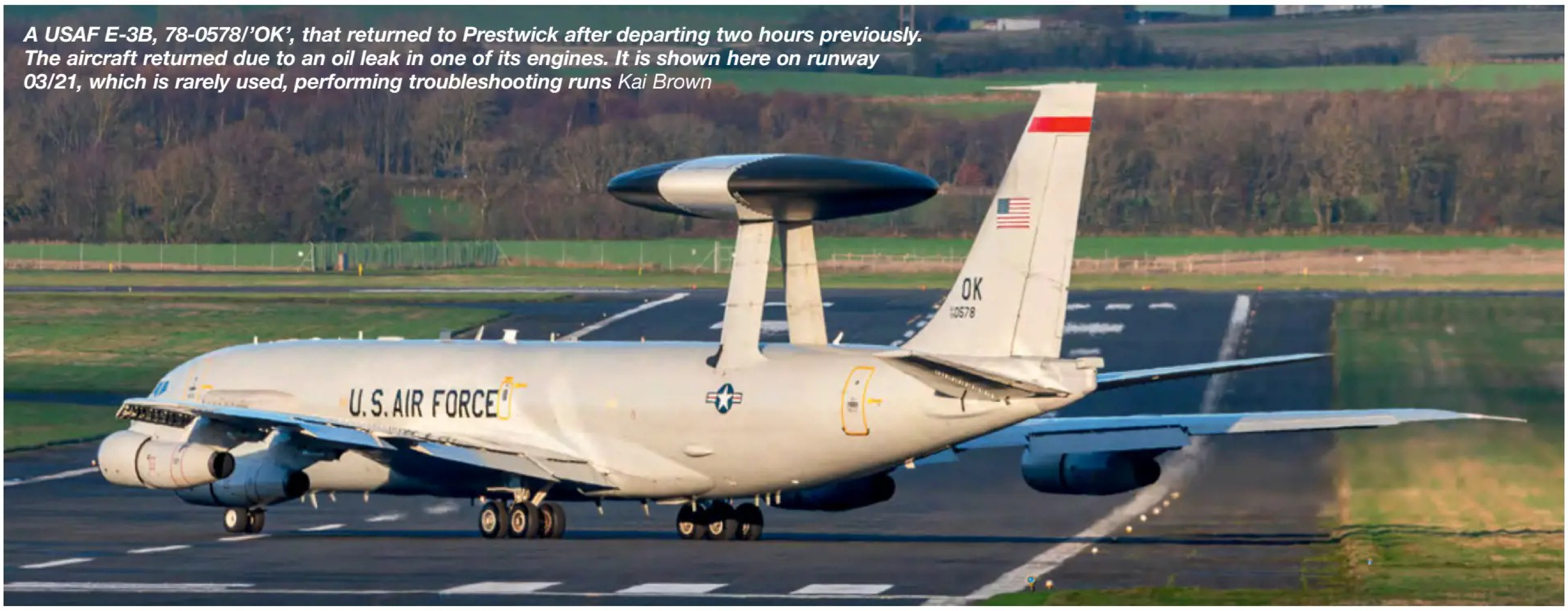
Pakistan Air Force Airbus A319-112 (callsign 'PAAF052') passed through Farnborough early in the morning on November 16. It arrived from Istanbul at 0820hrs and returned just before 1000hrs. It is based at PAF Base Nur Khan and operates with No.12 (VIP) Squadron 'GlobeTrotters' *Ian Harding*



French Air Force DHC-6 Twin Otter F-RACC departs IWM Duxford on November 20 as COTAM 1123 after a day trip to the Cambridgeshire Museum *Michael Miskin*



A Joint Base Pearl Harbor-Hickam-based 535th Airlift Wing C17A, 05-5152/'HH', sat at a sunny but chilly RAF Mildenhall on November 18. It arrived from Ramstein AB on November 9 *Karl O'Kane*



A USAF E-3B, 78-0578/'OK', that returned to Prestwick after departing two hours previously. The aircraft returned due to an oil leak in one of its engines. It is shown here on runway 03/21, which is rarely used, performing troubleshooting runs *Kai Brown*

Mission accomplished

For ten years, the RAF has been paying a major part in the war against the Islamic State in the Middle East. Operation Shader is set to end in 2025 and Tim Ripley looks at how the UK's role in the sensitive region could change

At the end of September 2024, the UK Ministry of Defence posted a short notice on its website: "The United States and Iraq have announced the Global Coalition against Daesh's [Islamic State] military mission will draw to a close over the next 12 months. The terrorist organisation has been territorially defeated in Iraq. The United Kingdom will continue to support the security of Iraq, as the Global Coalition enters a new phase. The UK will work closely with our Iraqi partners to develop an enduring bilateral relationship during the coming months, as part of the transition to a new security and defence partnership with Iraq."

With the news agenda at the time focused on the Gaza crisis and the war in Ukraine, no UK newspapers covered that announcement. Perhaps their editors and most of the public thought the war against the Islamic State finished years ago and there were no British 'boots on the ground' or 'aeroplanes over the Middle East'.

But as events in April showed – when Royal Air Force Typhoon jets joined in the defence of Israel against Iranian missile and drone attacks – British airpower is still very evident in Arabian skies.

For the air force and other British military services in the Middle East, the MOD's September 2024 announcement formally set in train a process to 're-imagine' the RAF's lay-down and operational activity across this strategic region.

Operation Shader evolves

The operation began in August 2014 when the RAF was scrambled to join its US allies in a desperate bid to hold back Islamic State columns advancing on Baghdad and the Kurdish region of Northern Iraq. In a matter of weeks, jihadi fighters had surged across Iraq and the country's US-trained army looked on the verge of collapse. US President Barack Obama ordered the Pentagon to prop up Baghdad's army with air strikes and launched a training mission to rebuild its forces. Special forces teams were then deployed to launch raids into Islamic State controlled territory to capture high value targets and attempt to release westerners held hostage by the brutal group. The following year, US forces started to help Kurdish fighters in Eastern Syria, under the banner of the Syrian Democratic Forces, who were the main resistance to the jihadi group's fighters. When Paris and London came under attack by Islamic State terrorists, defeating the group in its strongholds in Iraq and Syria took on a new urgency.

Britain joined the US-led mission, code-named Operation Inherent Resolve, from the start and soon dozens of other nations sent military contingents. Like the Americans, Prime Minister David Cameron was not keen on sending combat troops to fight the jihadi threat on the ground and the RAF became the main British offensive involvement in the mission. But hundreds of British soldiers went to train Iraqi troops at bases far from the front line and Special Air Service troops worked with American counterparts advising Kurdish fighters inside Syria.

Over the next five years, RAF aircraft were flying daily missions against targets in Iraq and Syria, as local fighters started

The retirement of the Tornado in 2019 meant the RAF's Typhoon squadrons were now solely responsible for providing fast jets for Operation Shader

All images MOD/Crown Copyright unless stated to advance against the jihadis. In July 2017, Iraqi troops recaptured Mosul in northern Iraq and a few months later Kurdish troops scored a major coup by capturing the capital of Islamic State Caliphate, the Northeastern Syrian city of Raqqa. The remnants of the group fled to the town of Baghuz in the central Euphrates valley, where they held out for another eight months under relentless US and British bombing. In March 2019, hundreds of half-starved Islamic State fighters and their families surrendered to Kurdish fighters and were trucked to a network of prison camps. Many others fled into the desert region astride the Syria-Iraqi border in small groups in the hope of laying low and eventually resurrecting the group.

This brought on a new phase of Operations Inherent Resolve/Shader. The training of Iraqi and Kurdish forces in Syria continued, but coalition air and ground operations evolved considerably. Across Syria and western Iraq, a series of forward operating bases were established alongside local forces to allow US and British intelligence operatives to watch for signs of an Islamic State resurgence. If positive intelligence were detected, special forces raids would be mounted to capture prisoners and seize intelligence material. Coalition air surveillance continued for this intelligence gathering effort and strike aircraft or armed drones were used to attack any targets that needed a rapid response. Transport helicopters were deployed to move special forces' strike teams. The high point of this was a US special forces' raid in October 2019 that killed the head of the Islamic State, Abu Bakr al-Baghdadi.

Since then, the RAF has played a leading role in the evolving Operation Shader.

Airpower support

A contingent of the British Special Forces and intelligence operatives remained in eastern Syria, helping their American counterparts train Kurdish fighters, monitoring the situation and launching raids against Islamic State suspects. One Special Air Service soldier, Sergeant Matt Tonroe, was killed in the northern Syria town of Manbij during a US-led raid in 2018 on an Islamic State safe house. A small contingent of around 100 British troops remained in the city of Erbil in northern Iraq to train Kurdish personnel and protect the British logistic base at its airport.

UK air support now settled into a routine. Each of the RAF's seven Typhoon squadrons took turns to spend four months at a time at RAF Akrotiri on Cyprus flying missions in support of Operation Shader, backed up by Airbus A330 Voyager tanker aircraft on detachment from RAF Brize Norton in Oxfordshire. Five or six times a week, a pair of Typhoons would launch from RAF Akrotiri to patrol over Iraq and eastern Syria, ready to respond to calls for close air support from coalition troops.

Launch and recovery elements were also maintained at Ali Al Salem airbase in Kuwait as part of the US-UK unmanned aerial vehicle (UAV) force, operating General Atomic MQ-9 Reapers. These armed drones sustained a network of patrols over the region. They monitored strategic zones, looking for Islamic State fighters and arms stores and flying security patrols around coalition bases. If necessary, they could use their AGM-114 Hellfire missiles or Paveway IV laser guided bombs to strike at ground targets. Air surveillance over Iraq and eastern Syria was also occasionally augmented by RAF Beechcraft Shadow R1 aircraft, which are equipped with electro-optical cameras and signals intelligence equipment.

RAF humanitarian aid drops to Gaza continued into April 2024, with A400Ms staging out of an airbase in Jordan

The British Army detachments there were sustained by logistic support flights every couple of days flown by Airbus A400M Atlas transport aircraft forward based at RAF Akrotiri. They flew a 'milk run' between bases in the Middle East, dropping off supplies or moving British personnel around. Within Iraq and Syria, a detachment of 7 Squadron's Boeing Chinook HC6 heavy lift helicopters was used to move British troops to remote locations from their base at Erbil Airport.

The Iraqi security force was now proving more than capable of keeping a lid on Islamic State activity and there was less need for them to call on coalition airpower. Compared with the 'kinetic phase' in the first five years of Operation Shader, in recent years the tempo of RAF offensive action has tapered off considerably. In 2022, there were three RAF air strikes, two took place in 2023 and at the time of writing in 2024 there have been two.

Mission creep?

In the Vietnam war in the 1960s, the phrase 'mission creep' came into common usage to describe the phenomenon where a military mission was launched and eventually ended up being something totally different, often due to factors completely out of control of senior decision-makers.

Some observers can be forgiven for thinking Operation Shader is suffering from that 'mission creep', as RAF aircraft deployed to Middle East for the counter-Islamic State mission appear to be being used for very different tasks.

The biggest example of this is the growing involvement of British forces in Middle East

The third wave of RAF Typhoon strikes against Houthi targets in Yemen took place on February 24, 2024

Left: ***RAF humanitarian aid drops to Gaza continued into April 2024, with A400Ms staging out of an airbase in Jordan***

Below left: ***After an RAF career of nearly 40 years the Tornado flew its last operational missions over Iraq and Syria in January 2019***

in the confrontation between the US and Iran and more recently between Israel and Iran.

During the first years of the war against the Islamic State, the US-led coalition found itself in an unofficial 'alliance of convenience' with Iran and pro-Iranian militias in Iraq. As a majority Shia country, the Iraqi government called on pro-Iran militias to help fight off attacks by the Islamic State's largely Sunni fighters. US-led forces kept their distance from the pro-Iranian militia groups, even though they were fighting the same enemy.

The dispersal of Islamic State of 2018-19 meant that tension between Washington and Tehran worsened as the need to fight the 'common enemy' reduced. In January 2020, US President Donald Trump authorised a drone strike on the senior Islamic Revolutionary Guard Corps (IRGC) commander, General Qasem Soleimani, as the Iranian officer visited Baghdad.

Clashes between Iranian and US forces escalated across Iraq, as both sides traded fire. British troops shared many bases in Iraq with their US allies, which resulted in a British soldier being killed in a rocket attack by a pro-Iranian missile on Taji camp in March 2020. RAF Typhoons and Reaper drones flew numerous 'top cover' missions over coalition bases in Iraq during this period, to be ready to provide close air support if they came under attack. No weapons were released at this time.

Other missions started proliferating as early as April 2018, when RAF Tornado GR4s took part in US-led air strikes on Syria, in response to the Damascus military's use of chemical weapons against rebel fighters close to the country's capital.

When Russian troops invaded Ukraine in February 2022, NATO asked member states to provide fighter aircraft to patrol over Eastern Europe to deter Moscow from attacking alliance territory. The Operation Shader Typhoon detachment of Cyprus soon found itself drawn into this effort, flying combat air patrol over Romania and Bulgaria

Operation Inherent Resolve

Britain's contribution to the war against the Islamic State was fought under the umbrella of the US-led Combined Joint Task Force Inherent Resolve. This was set up in the autumn of 2014 to oversee the campaign in Iraq and Syria from its headquarters at Camp Arifjan in Kuwait. Its air component headquarters was at Al Udeid airbase in the Gulf state of Qatar and day-to-day air operations were controlled from its combined air operations centre, or CAOC. For much of the campaign an RAF air commodore was assigned to the CAOC as its deputy director and UK air component commander.

In 2023, the RAF moved to a more centralised control of air operations with No 11 Group at RAF High Wycombe in Buckinghamshire taking on more responsibility for planning and directing missions. As a result, the UK air component command in the CAOC was downgraded to a group captain position.

Below: ***To sustain Iraqi communities besieged by Islamic State fighters, the RAF's 47 Squadron launched air drops of humanitarian aid in August and September 2014***

The RAF's Reapers relocated to Ali Al Salem air base in Kuwait for Operation Shader, where they worked as part of a joint launch and recovery unit with the USAF from the autumn of 2014
USAF

Tornado GR4s from RAF Akrotiri made the first British air strikes against the Islamic State in September 2014

after flying up over Greece with Voyager tanker support.

After an RAF Boeing RC-135 Rivet Joint electronic eavesdropping aircraft was fired on by a Russian Sukhoi Su-27 *Flanker* fighter while on a patrol over the Black Sea in September 2022, the Cyprus-based Typhoons picked up a new mission. Whenever an RC-135 patrolled over the Black Sea a pair of Typhoons, backed by a Voyager tanker, would be launched from RAF Aktrotiri to escort the signals intelligence aircraft.

After a civil war broke out in Sudan in April 2023, RAF assets across the Middle East were mobilised to help in a non-combatant evacuation operation (NEO) to bring British passport-holders out of the country's

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Operation Shader saw the operational début of the RAF's new RC-135 Rivet Joint signals intelligence gathering aircraft in June 2014, weeks before other RAF aircraft became involved in the war against the Islamic State

E-3D Sentry aircraft joined Operation Shader to co-ordinate RAF and allied air assets across the Middle East on regular deployments from 2015 to 2021

Operation Shader – sunset aircraft

The past decade of air operations in the Middle East has seen the sun set on several important RAF aircraft types. When Operation Shader started in 2014, the RAF main strike aircraft was the Panavia Tornado GR4, its main tactical transport aircraft was the Lockheed Martin C-130J Hercules and the service boasted an impressive fleet of manned aerial surveillance aircraft. These included Boeing E-3D Sentry AWACS and the Raytheon Sentinel R1 airborne stand-off radar aircraft.

The Tornado GR4 retired in 2019, the C-130J went in 2023, the E-3D and the Sentinel R1 both retired in 2021. The Reaper looks set to follow this trend and is expected to be retired from RAF service after it concludes its frontline service in 2025.

capital, Khartoum, and Port Sudan on the Red Sea.

Long missions from Kuwait were flown to the African country by RAF Reapers to monitor the arrival of HMS *Lancaster* in Port Sudan to pick up fleeing Brits. The Chinook detachment was also re-located from Iraq to Jeddah in western Saudi Arabia as a precaution in case fixed-wing evacuation flights from Khartoum were not possible.

After the outbreak of the Gaza war between Israel and Hamas in October 2023, the Operation Shader air component found itself in uncharted territory, having to deal with new and unexpected threats.

Houthi rebel fighters started attacking merchant shipping in the Red Sea in a bid to cut off maritime traffic to Israel. Britain sent a Royal Navy destroyer to keep the sea route open, but when attacks escalated in January 2024, RAF Typhoons flying from Cyprus joined the US Navy to hit Houthi targets in Yemen on four occasions.

British troops in Iraq and Syria again came under attack by armed drones controlled by pro-Iranian militia. When Iran fired a barrage of 350 ballistic and cruise missiles plus armed drones at Israel in April 2024, the RAF joined a US-led coalition operation to intercept these weapons.

Endgame strategy

As the Gaza war was spreading across the Middle East in 2023 and into 2024, the US and coalition presence in Iraq was becoming increasing unpopular with the country's government and people; they were unhappy with their homeland being used by others as a battlefield. Pro-Iranian militias were firing rockets and drones at British and US bases, while the US was firing back, in many cases seemingly without Iraqi permission. The Baghdad government opened negotiations with the Americans and British about withdrawing their troops. This culminated in September 2024 with an announcement by Washington and Baghdad about the future of Operation Inherent Resolve. The US government said it would withdraw the bulk of its 2,500 troops from Iraq by the end of 2025 except for a small contingent to be based in Kurdistan. The long-term future of the 900-strong US troop presence in Syria was not addressed in Pentagon statements, although without its bases in Iraq the Americans and British would clearly struggle to operate in Syria as they do now.

For Britain, the new environment creates very specific issues for the RAF. A senior UK MOD

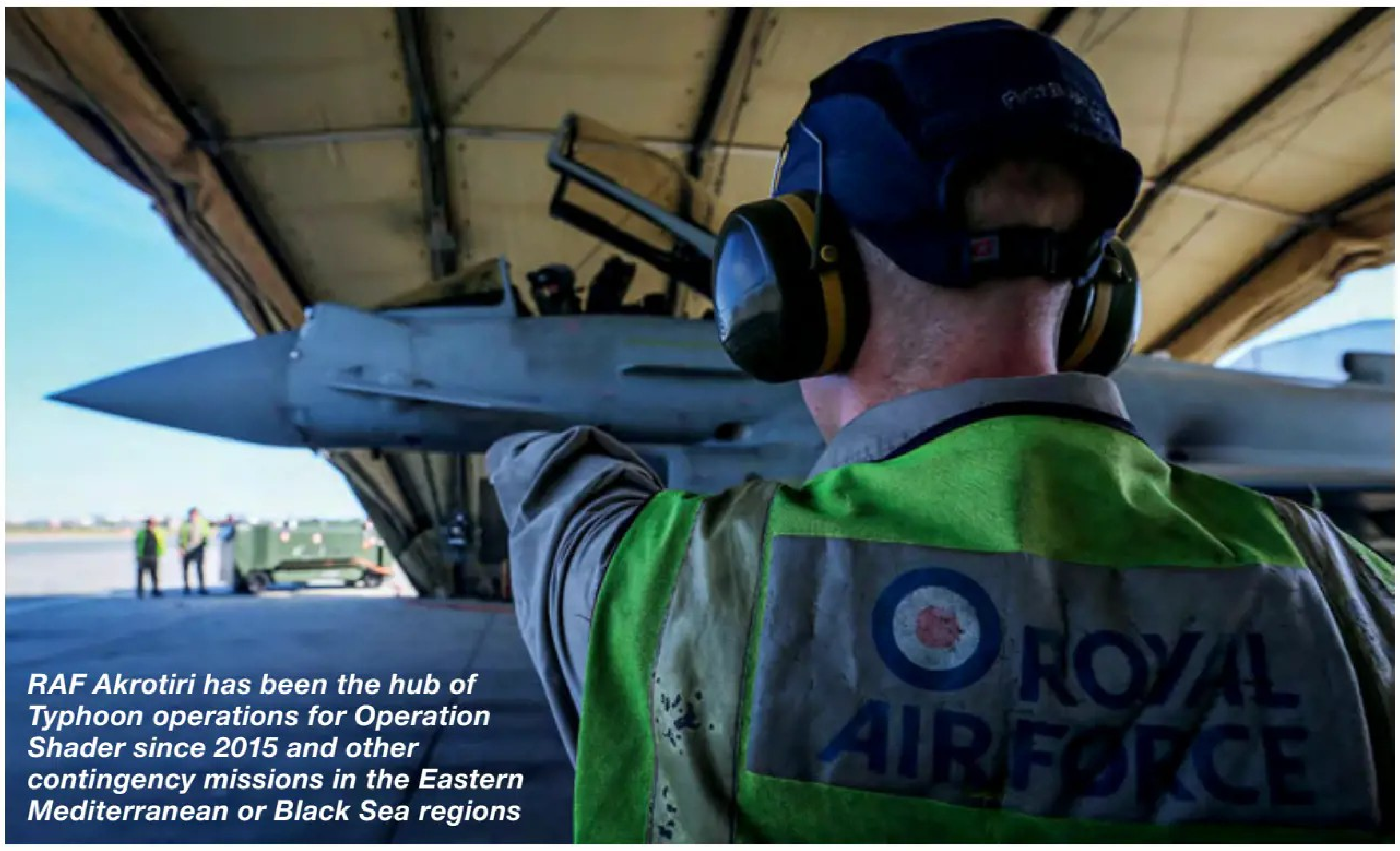
The RAF's Sentinel R1 airborne stand-off radar aircraft were mobilised for Operation Shader in 2015 to use their unique capabilities to monitor Islamic State troop movements

In May 2019, the RAF deployed its newest jet, the F-35B Lightning II, to Cyprus to join Operation Shader for two months. The aircraft did not release any ordnance

Left: ***Four Tornado GR4s of 31 Squadron fired eight Storm Shadow cruise missiles in the night-time attack on Syria in April 2018***

official explained that the ending of Operation Shader would at a stroke remove justification of its £110 million budget. Operation Shader also provides justification of diplomatic clearances, airspace and air base access agreements that the RAF uses across the Middle East.

“We in effect will have to go back to square one with the British Treasury and our allies


RAF Akrotiri has been the hub of Typhoon operations for Operation Shader since 2015 and other contingency missions in the Eastern Mediterranean or Black Sea regions

across the Middle East," said the official. "It is one thing to get approvals to fight Islamic State back in 2014 and 2015. Then everyone agreed on that, and the Treasury was willing to pay for it. Now we must come up with a whole new set of justifications. If we end up with just a small British footprint in Syria with the Americans, you need a whole different set of arguments. That is a far more difficult sell for many reasons."

The official was perhaps referring to perceived unwillingness of the British government to admit in public and to Parliament that it has 'boots on the ground' in Syria.

There are some other factors in play that could impact on the RAF footprint in the Middle East. The air force is scheduled to retire its Reaper UAVs in the summer after the General Atomics Protector RG1 drones enter service. This would be an inflection point, determining whether the RAF keeps a drone capability in the Middle East in case of unexpected events.

The biggest cost to the RAF under Operation Shader is keeping a squadron of combat-ready Typhoons at Akrotiri. Every four months, a squadron must be brought up to combat readiness and deployed to Cyprus with a full complement of pilots, ground personnel, weapons and a stock of spare parts. This does not come cheap, but as we saw with the diversion of the Operation Shader Typhoons to the Black Sea and to protect Israel, there is great strategic significance in having combat-ready jets on Cyprus.

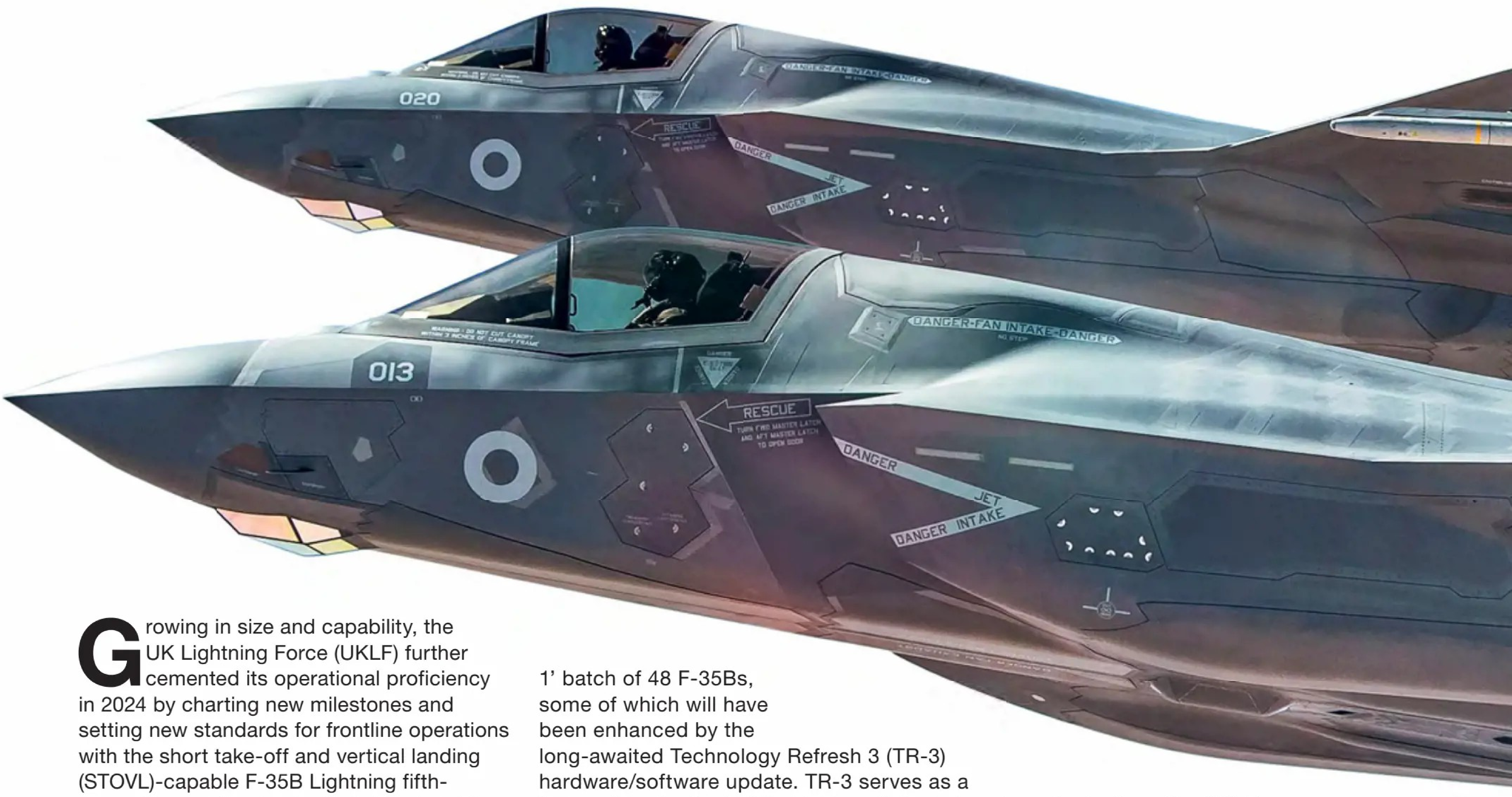
It will be interesting to see if that case is made and won, to continue to maintain a Typhoon force in Cyprus, on a continuous basis. There may be an attraction to move to a model of just deploying aircraft to the island on regular exercises. However, this would mean there might be gaps in Typhoon presence. As the defence of Israel in April 2024 showed, there might not be time to generate and deploy aircraft from bases in the UK to Cyprus.

Over the past decade, the RAF has conducted more than 10,000 sorties striking around 1,400 targets, as well as providing critical surveillance and reconnaissance in support of ground operations, under the banner of Operation Shader. Continuing instability in the Middle East means it is very likely that the RAF will remain on duty in the region even if the current footprint has to change. **afm**

Kobani airstrip in Syria was built by US engineers in 2016, to allow US and British special forces to join the Kurdish offensive against the capital of the Islamic State, Raqqa
US DoD/Combat Camera

The growing storm!

Group Captain John Butcher, Commander of the UK Lightning Force, tells Khalem Chapman how the British F-35B fleet developed operationally through 2024 and how the force and its capabilities will evolve beyond 2025



Growing in size and capability, the UK Lightning Force (UKLF) further cemented its operational proficiency in 2024 by charting new milestones and setting new standards for frontline operations with the short take-off and vertical landing (STOVL)-capable F-35B Lightning fifth-generation multi-role stealth fighter (see The Lightning Grows Fiercer, p50-53).

From joining the UK Carrier Strike Group (UKCSG) on training deployments with NATO allies as part of Exercise Steadfast Defender 2024 (SD24) and Exercise Strike Warrior 2024 (SW24), to proving the shore-based air defence capabilities of the Lightning during Operation Masterer in Iceland (see 'Mastering All Trades', *AFM* December 2024), the UKLF has continued to reach new operational heights. When considering upcoming operations, including the fleet's highly anticipated long-term CSG-25 deployment to the Indo-Pacific next year, such activities are helping the force mature its mission set and gain experience ahead of its scheduled declaration of Full Operational Capability (FOC), due to be achieved by December 31, 2025.

Achieving FOC is the tip of the spear for the UKLF as the F-35B is at the start of its capability growth pathway. In 2025, the UKLF will welcome the last of its initial 'Tranche 1' batch of 48 F-35Bs, some of which will have been enhanced by the long-awaited Technology Refresh 3 (TR-3) hardware/software update. TR-3 serves as a key enabler for the F-35's highly anticipated Block 4 capability upgrade, which, despite delays is set to be rolled out before the end of this decade. The short- to medium-term future of the UKLF is exciting. As the fleet grows, so too will its capabilities.

Commander of the UKLF Gp Capt John Butcher, said: "Everyone here is passionate about delivering this capability and excited about this final drive towards FOC. Of course, this is just a small waypoint on the growth pathway of the UKLF, which has many decades of flying ahead of it."

Joint force mentality

Headquartered at RAF Marham in Norfolk, the UKLF comprises three squadrons. No 617 Squadron 'The Dambusters' and 809 Naval Air Squadron (NAS) 'Immortals' serve as the operational frontline element of the UKLF and regularly deploy aboard the Royal Navy's Queen Elizabeth-class aircraft carriers, HMS Queen Elizabeth (R08) and HMS Prince of Wales (R09). No 207 Squadron plays an important role as the UKLF's Operational Conversion Unit (OCU), training Air Force and Navy personnel to fly, operate and maintain the F-35B and its capabilities from land and sea. Meanwhile, No 17 Test and Evaluation Squadron (TES) conducts UK-specific F-35B testing from Edwards AFB, California – operating as part of the Air and Space Warfare Centre – where it also supports wider operational test objectives for the global Lightning II fleet.

Further proving the UKLF's joint force structure is how Air Force and Navy air/ground crews are pooled and assigned to each squadron, regardless of service badge. This mix is seen across the UKLF, from training through to leadership. The appointment of Lt Col Mike Carty as the boss of 'The Dambusters' on September 26, becoming the first Royal Marine Commando pilot to take charge of a British fast-jet squadron, is a key example.

While UKLF-destined air/ground crews were previously sent to the US to complete their

F-35B training, that requirement has now been brought ‘in-house’ following the return of 207 to Marham as the type’s OCU in August 2019. “We’re permanently training pilots and maintainers [here]; it’s a constant conveyor belt of people going through that system,” Butcher explained, adding that the training process differs slightly when compared with the US system. “There are some subtle differences because of weapon loadouts – with us having Paveway IV [laser-guided bombs (LGBs)] and Advanced Short-Range Air-to-Air Missiles (ASRAAMs) – but the broad principles are exactly the same.”

With no dual-seat aircraft available, the UKLF relies heavily on Full Mission Simulators to train pilots, enabling the force to virtually teach/assess everything from basic flying skills to tactical operations against potent threats over land and at-sea, while still employing the high-end tactics, techniques and procedures (TTPs) developed by the force. Butcher confirmed that 207 operates a 50/50 mix of synthetic training using these simulators, as well as live flying operations from Marham or the British ‘flattops’.

Butcher detailed the number of pilots currently assigned to the UKLF to maintain operational security (OPSEC). “We have about 30 or so pilots here. It varies on postings. A typical squadron deployment will vary depending on the task. When we go to the carrier, it will be configured for that particular task. When we go anywhere else, we will configure the pilot numbers as required to deliver the mission.” He also noted that there are ongoing squadron exchanges with F-35 units in the US and Australia.

On the Frontline

Last year (2024) proved important for the UKLF’s two frontline units. Having served as the UK’s only combat-ready Lightning squadron since the first jets arrived at Marham in June 2018, ‘The Dambusters’ were joined by the ‘Immortals’. The former now plays a key role in supporting the work-up of the UKLF’s second frontline F-35B unit.

020
ZM154
013
ZM147
BEWARE OF BLAST

F-35Bs (ZM147/‘013’ and ZM154/‘020’) conduct the UKLF’s first combat mission in support of Operation Shader in June 2021 *MOD Crown Copyright/Cpl Lee Matthews*

Group Captain John Butcher, Commander UK Lightning Force seen at the standing up of 809 NAS in December 2023. *Alan Warnes*

An F-35B (ZM162/‘028’) departs a damp RAF Marham on September 30 *MOD Crown Copyright/Sgt Nik Howe*

These F-35Bs (ZM161/'027' and ZM164/'030') in their unique STOVL configuration as they prepare to land aboard HMS Prince of Wales after completing a mission as part of Exercise Nordic Response 2024 on March 5 *MOD Crown Copyright/AS1 Amber Mayall*

With six years of frontline experience with the F-35B under its belt, 617 has helped to mature the TTPs of the wider UKLF, employing lessons learned from previous carrier- and land-based deployments to help bolster the force's overall ability to project UK combat airpower. These well-established TTPs and the plethora of experience gained by 'The Dambusters' are invaluable to 809 as it grows.

After being deactivated in 1982, the 'Immortals' returned to the fold on December 8, 2023, when the Fleet Air Arm (FAA) unit was reactivated at Marham. Led by Cmdr Nick Smith, the squadron marked a key milestone in July, when it completed its first independent F-35B sortie from Marham, with the jet being flown, maintained, dispatched and recovered by personnel from 809.

The 'Immortals' have since continued to gain combat-ready status. Such efforts came to a head in October, when 809 joined elements of the wider UKLF aboard *Prince of Wales (PoW)* during SW24, marking the first time in nearly 15 years that an FAA-badged fast-jet squadron had operated from the flight deck of a Royal Navy carrier.

Held off the coast of Scotland on October 14-27, the drill sought to test and confirm the UKCSG's operational readiness ahead of CSG-25. In total, eight F-35Bs and approximately 200 UKLF personnel embarked aboard *PoW*. While this falls short of the number of F-35Bs and personnel expected to deploy with the warship for CSG-25, it enabled 19 UKLF pilots to gain their carrier qualifications and authorised the force's flight deck teams to conduct day/night operations.

Aircraft flying from *PoW* flew 71 sorties, totalling 210 flight hours, during SW24. British F-35Bs also dropped four Paveway IV LGBs on the Cape Wrath Training Area in Sutherland, Scotland, during a live-fire event, further proving the force's ability to deliver combat effects from the 'flattop'. The UKCSG and UKLF will conduct more training around the UK before the task force embarks on CSG-25.

Prior to its participation in SW24, the UKLF took part in the RAF-led Exercise Cobra Warrior 24-2, during which the force mostly played the 'Blue Air' role. "During Cobra Warrior, we were predominantly operating in our core mission sets, which the F-35 is very good at – Defensive/Offensive Counter-Air (DCA/OCA) and Suppression of Enemy Air Defences (SEAD) – and very much actively exercising the capabilities that we're really good at and helping those in a broader air fight to do their mission sets and allow them access in contested environments," Butcher explained.

Growing the Fleet

As of November 20, the UKLF had received 35 of its initial 'Tranche 1' procurement order of 48 F-35Bs. Of these, one aircraft (ZM152/'018') was written-off when it crashed into the Mediterranean Sea while attempting to take-off from *Queen Elizabeth* for a routine mission during the final leg of the UKCSG's long-term Operation Fortis (CSG-21) deployment on November 17, 2021. Another three jets are currently used for test and evaluation activities with No 17 TES, leaving 31 F-35Bs at Marham to support ongoing training efforts and operational missions.

The UKLF will receive the last 13 of its first 48 'Tranche 1' F-35Bs before the fleet achieves FOC. "We're expecting the next batch in the Spring, and then there'll be an incremental rollout for the remaining part of 2025. In terms of software, we're expecting that they will all be TR-3 jets," Butcher explained.

Marham also expects to welcome the three early jets (ZM135/'001', ZM136/'002' and

026
617 SQN
AV

Flight deck personnel from 617 Squadron and 809 NAS conduct dispatch procedures before launching an F-35B (ZM160/'026') from Prince of Wales during SW24 on October 21 *MOD Crown Copyright/ AS1 Amber Mayall*

An F-35B (ZM161/'027') is seen armed with two ASRAAMs while returning to Marham after completing Operation Masterer in Iceland on September 2 *MOD Crown Copyright/Alex Gill*

ZM138/'004') currently used by No 17 TES, after Lockheed Martin was awarded an $8.7m contract to remove flight test instrumentation from these F-35Bs on July 3. Butcher said this will release the early aircraft that were sent to Edwards, although it remains unclear how long this process will take. He also confirmed that the UK MOD also intends to source an attrition replacement for ZM152/'018' during the next procurement phase.

While Britain's F-35B procurement plans have become something of a political flashpoint in recent years, Butcher asserted that the UK remains committed to acquiring 138 aircraft. So far, two F-35B procurement phases have been announced – dubbed 'Tranche 1' and 'Tranche 2'. "Delivery of the initial 48 is due to be completed at the end of FY25/26, with the second procurement phase to buy [another 27 jets] to bring the fleet up to 74 aircraft through the remaining part of this decade," he said.

Capability boost

While a year-long delay in global F-35 deliveries was enforced by the US due to the software instability of Lockheed Martin's TR-3 update, Butcher stressed that this will not impact the UKLF's plans to declare FOC in 2025, nor is it expected to affect the delivery of the wider Block 4 capability upgrade by 2030.

"[TR-3] is a precursor to the wider Block 4 upgrade, which will enhance all of the capabilities across the combat spectrum and that will fall in line with the planned spiral development of the platform… We do still expect to receive Block 4-configured jets this decade. Clearly, there have been some well publicised delays on the TR-3 release, [but] from a UK perspective, that has no impact on our declaration of FOC, so it's not something that concerns me," he explained.

Described as the 'backbone' of the wider Block 4 upgrade, the TR-3 hardware/software update will add extra computational horsepower to the F-35, as well as an open-system architecture to facilitate further upgrades in the future and an enhanced panoramic cockpit display. Meanwhile, Block 4 will introduce more than 75 major upgrades to the F-35, enabling it to carry an increased volume and variety of advanced weapons, conduct enhanced EW operations and provide it with an ability to better identify and track targets with the AN/APG-85 AESA radar (from Production Lot 17 onwards), while expanding its data fusion capabilities and cross-platform interoperability through the upgrade and addition of new sensors.

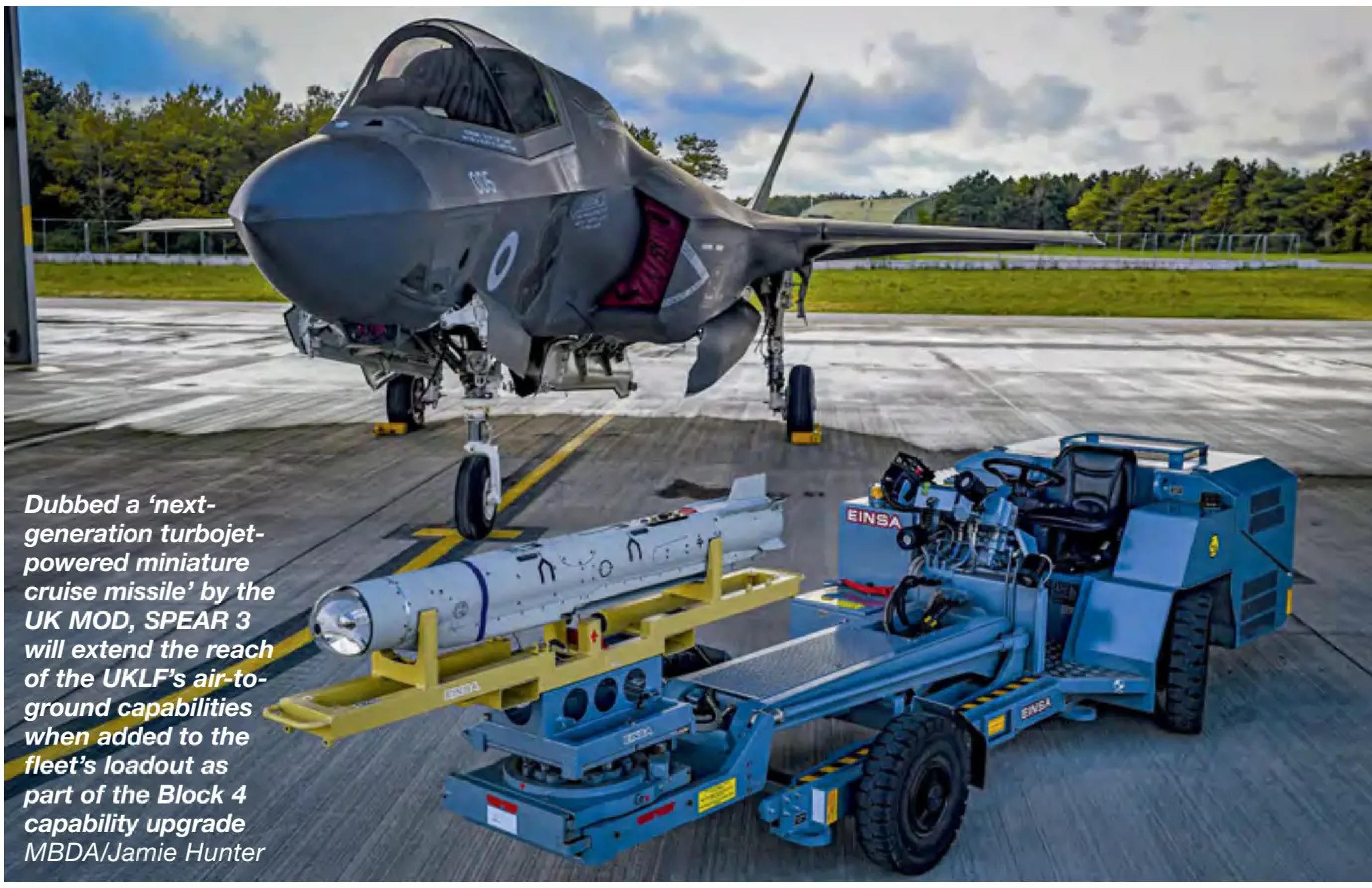
While the UKLF expects to receive its first TR-3 software-configured F-35Bs in 2025, the 31 Marham-based jets will need to be progressively upgraded to the same standard before they can receive the wider Block 4 package. "The plan is to facilitate local software upgrades. There are some elements of this that will require a hardware exchange, and I anticipate that we'll be able to do that [here]. It may be that some get done in the US for other reasons, but broadly speaking, we're planning for them to be done here," Butcher stated.

Block 4 will also bring significant UK-centric capability enhancements for the UKLF, with the integration of MBDA's Meteor beyond-visual-range air-to-air missile (BVRAAM) and SPEAR 3 'miniature air-launched cruise missile' to the platform's arsenal. While the RAF has already integrated Meteor onto its Typhoon fleet as part of the Project Centurion upgrade, the BVRAAM is due to be added to the F-35B's loadout before 2030. As per current plans, the munition – which will greatly enhance the UKLF's ability to conduct air-to-air combat at greater stand-off ranges – will

UKLF personnel conduct pre-flight checks on an F-35B (ZM162/'028') during a night flying drill in support of aircrew carrier qualifications aboard Prince of Wales during SW24 *MOD Crown Copyright/AS1 Amber Mayall*

British F-35Bs on Prince of Wales' flight deck following the conclusion of SW24 on October 27 *MOD Crown Copyright/AS1 Amber Mayall*

A British F-35B (ZM153/'019') alongside MBDA's Meteor BVRAAM at Marham in 2021 *MBDA/Jamie Hunter*



Dubbed a 'next-generation turbojet-powered miniature cruise missile' by the UK MOD, SPEAR 3 will extend the reach of the UKLF's air-to-ground capabilities when added to the fleet's loadout as part of the Block 4 capability upgrade *MBDA/Jamie Hunter*

be modified to allow it to be carried internally by the fifth-generation fighter.

Designed primarily for use by the F-35B, SPEAR 3 will complement Paveway IV and enhance the UKLF's ability to strike both land- and naval-based targets at greater stand-off ranges. Weighing only 6-10kg (13-22lb), the small size but extended range of SPEAR 3 will enable the F-35B to carry up to eight missiles internally, granting it an ability to swarm targets with multiple munitions to overwhelm air defences. SPEAR 3 will further amplify the UKLF's ability to conduct SEAD operations, while also providing it with another option when conducting anti-surface warfare (ASuW) missions.

On November 18, the MOD announced that it had successfully completed the first guided live firing of a SPEAR 3 missile from a Typhoon assigned to No 41 TES at RAF Coningsby, Lincolnshire. The trial – which took place at the Vidsel Test Range in Sweden – saw the missile autonomously find its target (a main battle tank), before using its all-weather radar seeker to map the target area and successfully engage it using the radiofrequency imagery gathered.

While development on Meteor and SPEAR 3 for the UKLF is progressing, it will be some time before the force is ready to integrate and field these munitions. "We've got some test and evaluation elements in the US that have already had exposure to what Block 4 is going to look like, but for SPEAR 3 and Meteor, the Defence Lines of Development (DLODs) are developing towards that. That's already begun, but we don't have an exact delivery timeframe at this moment," Butcher said.

Heading East

The UKLF will join the UKCSG in working up the operational readiness of the strike group as it prepares to embark on its highly anticipated CSG-25 deployment to the Indo-Pacific region. Led by *PoW*, the UKCSG is scheduled to depart the UK in April and will not return until the end of 2025. This deployment follows the same precedent that was set by *Queen Elizabeth* from May to December 2021, when the carrier led the UKCSG on a 55,000nmi voyage from the UK to the Indo-Pacific and back. Operation Fortis (CSG-21) was the first major long-term operational deployment for both the UKLF and the Navy's new 'flattops'.

014
ZM148
014

An F-35B (ZM148/'014') launches from the deck of Prince of Wales to conduct consolidation training with the wider UKCSG during SW24 *MOD Crown Copyright/AS1 Amber Mayall*

> ***"With the kind of threats we may face in the future, it's particularly important that, as UK Combat Air, we are ready to fly and fight together"***
>
> *Gp Capt John Butcher, UK Lightning Force Commander*

During Fortis, the UKCSG engaged with more than 40 different nations, further highlighting the importance of the UK's Carrier Strike Force and its ability to project combat airpower on a global scale.

During the upcoming CSG-25 deployment – which will closely mirror that of CSG-21 but with *PoW* at the helm – the UKCSG and UKLF will participate in a series of drills, operations and port visits. The mission also enables the UK to foster its defence relationships with allies and partners in the Far East, while also demonstrating and promoting its commitment to a free and open Indo-Pacific.

Butcher could not confirm how many F-35Bs will be joining *PoW* for CSG-25 due to OPSEC reasons, but he did note that it will involve elements from across the entire UKLF. "It will be a force deployment, so 617 and 809 will deploy together, and there may also be some people deployed from 207." He could not confirm whether the UKLF would again be bolstered by the presence of a USMC F-35B unit, as was the case during CSG-21.

It promises to be another key year for UKLF, as it develops its ability to project UK combat airpower across the naval battlespace through CSG-25 and closes in on its coveted FOC declaration. Beyond that, the UKLF will push its capabilities to new heights, further cementing the F-35B's overall lethality and dominance in the air, at-sea or over land. **afm**

Effective integration

Key to the UKLF's operation is its ability to integrate with various fourth- and fifth-generation fighters – RAF-operated Typhoon FGR4s, as well as the USAF F-35As of the 48th Fighter Wing (FW) at RAF Lakenheath, Suffolk. Butcher explained how this helps bolster the UK's ability to project combat airpower: "We [integrate] as often as we possibly can and try to make it routine business with the [Typhoon] squadrons at Coningsby, in particular, given how close they are.

"With the kind of threats we may face in the future, it's particularly important that, as UK Combat Air, we are ready to fly and fight together."

According to Butcher, the UKLF's ability to closely operate alongside the Typhoon will be strengthened by the rollout of the new European Common Radar System (ECRS) Mk2 electronic warfare (EW) radar, which completed its first flight in September. The powerful active electronically scanned array (AESA) radar will enable the Typhoon Force to also conduct the SEAD role, though he stressed that this will only "complement" the UKLF, which has also "improved" its TTPs in this mission set since the F-35B entered service.

Butcher also confirmed the UKLF routinely integrates with the 48th FW and its F-35As, conducting training that ranges from both air-to-air and air-to-ground missions. Such operations see the two forces each cover the 'Red Air' and 'Blue Air' roles, while also flying strike packages and working together to defeat simulated threats.

Held from January to May and billed as NATO's largest training event since the end of the Cold War, SD24 saw the UKLF train alongside some of its closest allies in the High North, namely the Norwegian F-35A fleet. In an offshoot of this large-scale exercise, the UKLF – operating from PoW in Norwegian waters – conducted a series of strikes to simulate the allied defence of Norway, while defending itself from aerial and sub-surface threats, as part of Exercise Nordic Response, held from March 3-14.

Two UKLF F-35Bs (ZM158/'024' and ZM140/'006') fly in formation with an RAF Typhoon FGR4 (ZK431/'431') over the Baltic region while deployed to Ämari Air Base, Estonia, in March 2022 *MOD Crown Copyright/SAC Tomas Barnard*

A Lightning (ZM161/'027') launches from the deck of Prince of Wales in response to a simulated threat during Exercise Joint Warrior – a UK-led drill that took place simultaneously with SD24 *MOD Crown Copyright/LPhot Belinda Alker*

Fighting for the future

As technology advances, the move to place fighter pilots in control of unmanned aircraft over the battlefield is gaining pace. Gerard Keijsper looks at how loyal wingmen have been transformed into Collaborative Combat Aircraft

The University of Iowa's Operator Performance Laboratory (OPL) 2 L-29 Delfins were used in the evaluation of artificial intelligence agents
Lockheed Martin Skunk Works

The new 'buzzword' in the defence industry is Collaborative Combat Aircraft. The most recent milestone that was passed in the United States was the Critical Design Review by contractors Anduril and General Atomics. The previous name for Collaborative Combat Aircraft (CCA) was loyal wingman. The question that is asked with each new fighter development is will it be the last manned fighter? Unmanned fighter aircraft will never see the light of day according to some, as the decision to drop a bomb cannot be left to an absent person or to a machine. The answer is probably that there will always be a manned fighter in the loop. The pilot is still considered the most valuable asset because it takes about 25 years to replace a trained pilot and two to three years to build a new fighter aircraft.

A bit of background

To send a pilot into harm's way safely, the fighter aircraft must be stealthy, manoeuvrable, and with enough power, with the right sensor suite and countermeasures. Sensor suite automation, combined with data fusion, reduces the pilot's workload so they can concentrate on being a tactician. Lockheed Martin has perfected sensor automation and data fusion for its F-35 fifth generation fighter.

The next step is to protect the pilot which an unmanned aircraft controlled by them can do by carrying out the work. The biggest problem is the workload. Looking to the future, the workload for the pilot flying the aircraft, managing the battlefield and operating unmanned aircraft must be taken into account and integration is key. The aim of the CCA

A Skunk Works graphic showing an F-35 with a variety of drones working alongside it. The Speed Racer is one of the Collaborative Combat Aircraft shown; other options represent the different increments
Lockheed Martin Skunk Works

The latest milestone: the L-39 Albatros aids the human battle manager in controlling two AI operated L-29s
Lockheed Martin Skunk Works

is to balance capabilities, cost, and the operational judgment of the pilot involved.

The early days with the UTAP-22

Kratos Unmanned systems was responsible for one of the first steps. It developed the Unmanned Tactical Aerial Platform-22 (UTAP-22). During the initial tests with the UTAP-22, which is launched by Rocket Assisted Take Off (RATO), control of the UTAP-22 had to be handed over from the ground controller to a pilot. The platform selected for the demonstration was the AV-8B Harrier, which is not the easiest aircraft to fly. The evaluation took place between October and December 2015. The demonstration culminated with the pilot controlling two UTAP-22. Another demonstration performed with the UTAP-22 was a part of Skydog programme in 2021. During this demonstration it was used to send data to a KC-135 Stratotanker upgraded with the real-time information in the cockpit (RTIC) system which included link 16, Situational Awareness Datalink (SADL) and secure Beyond Line-of-Sight communications. The RTIC program provided the pathway and baseline for the KC-135 to support the Advanced Battle Management System (ABMS) which had been created in 2017.

DARPA in the mixture

Artificial Intelligence is an important feature for the future operation of CCA teaming. This was evaluated in the X-62 VISTA by Defense Advanced Research Projects Agency (DARPA). The Lockheed Martin NF-16D VISTA was redesignated X-62 in July 2021 and is operated by the USAF Test Pilot School. The X-62 VISTA would play a huge role in the CCA programme. The X-62 underwent an upgrade which included an updated VISTA Simulation System (VSS) provided by Calspan, and Lockheed Martin's Model Following Algorithm (MFA), and System for Autonomous Control of the Simulation (SACS). The SACS and MFA systems integrated together provide new capabilities to the VISTA so it can be used to conduct the most advanced flight test experiments emphasising autonomy and AI. This allowed DARPA to evaluate two artificial intelligence systems that were able to perform both beyond-visual-range (BVR) engagements against a simulated adversary and within-visual-range dogfighting.

The first candidate

The next step in the evaluation was the US Air Force Research Laboratory-funded Kratos XQ-58A Valkyrie. The Kratos XQ-58 Unmanned Aerial Vehicle (UAV) is larger and heavier than the UTAP-22 which allows for bigger payloads, but it is launched in a similar way as the UTAP-22. Prior to the flight test demonstration, the flight control software was evaluated on the X-62. These tests allowed the XQ-58A to make its first RATO launch and subsequent first flight which lasted 72 minutes on March 5, 2019. The XQ-58A was a lot larger and could carry a bigger payload compared to the UTAP-22. The fifth flight of the Kratos XQ-58A took place December 9, 2020, at the Yuma proving ground. An F-22 Raptor (91-4007/'ED') and F-35A Lightning (11-5020/'OT'), the USAF's two fifth-generation fighters formed up off the wings of the smaller Valkyrie as it continued to fly autonomously in formation. A United States Marine Corps (USMC) F-35B also participated in the test. It was revealed by the AFRL XQ-58A Program Manager, Michael Wipperman that the Kratos XQ-58A platform has also integrated a new warfighting capability payload during the flight.

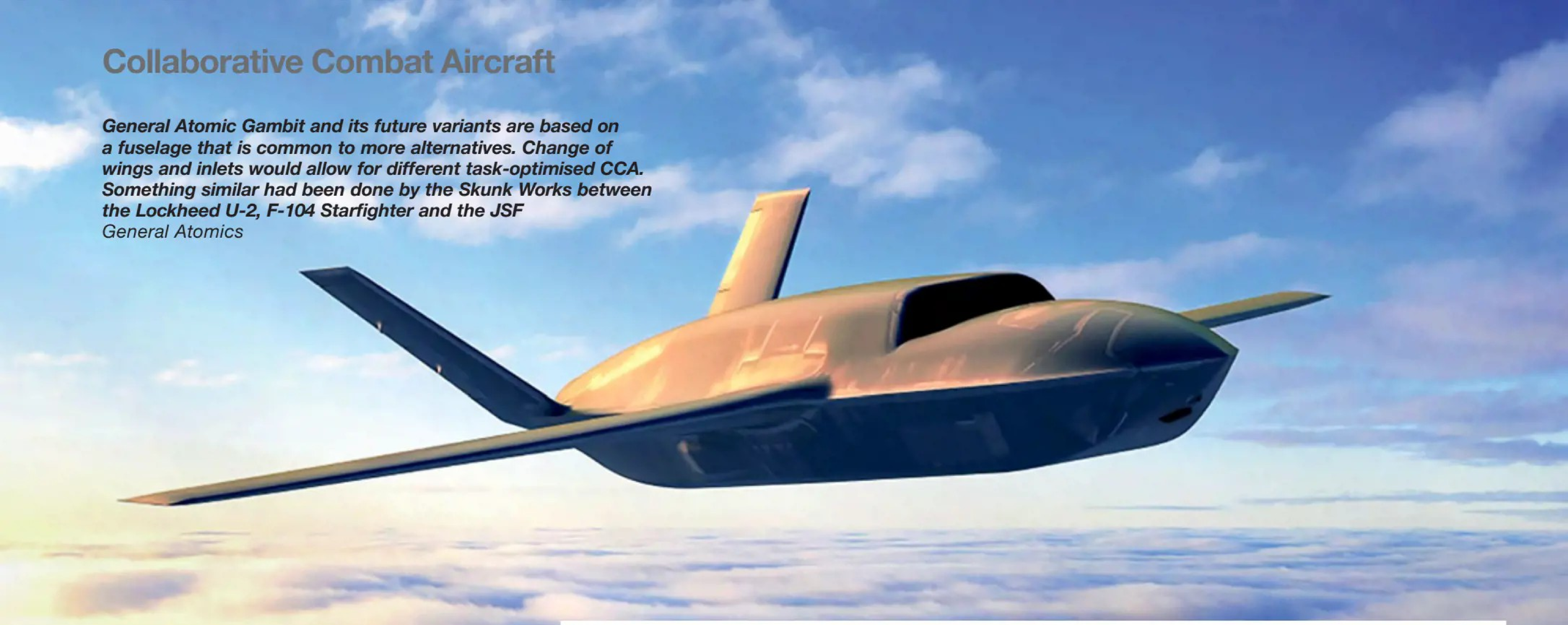
Fifth-generation fighters are typically limited to communicating with each other and to command-and-control centres via legacy tactical data connections, not in their native but incompatible digital 'languages' – Multifunctional Advanced Data Link (MADL) for F-35 and Intra-Flight Data Link (IFDL) for the F-22. Not only can gatewayONE translate between those formats, in this test it moved data that is normally relegated to an operations centre or tactical ground node, directly pushing it into the cockpit at the edge of the multi-domain battlespace for the first time. In other words, the incompatible advanced datalinks of the F-22 and F-35 could communicate with each other through the XQ-58A.

"The gatewayONE payload really showed what's possible and helped us take a big step toward achieving (Joint All-Domain Command and Control)," said Lt Col Eric Wright, a 59th Test and Evaluation Squadron F-35 pilot. "This critical capability provides additional connections between our advanced fighters and other forces and battle managers across all domains. The future is promising, and gatewayONE will allow the F-22 and F-35 to connect to and feed data sources they've never accessed."

Besides the Air Force Research Laboratory, the US Marine Corps started test flying a XQ-58A from October 3, 2023. The test flight occurred with the help of a USAF F-16 Fighting Falcon aircraft assigned to 96th Test Wing at Eglin Air Force Base, Florida. The second test flight with the USMC XQ-58A was in conjunction with two F-35Bs.

Skunk Works gets involved

Another project funded by the Air Force Research Laboratory (AFRL) and executed by the Lockheed Martin Skunk Works and Calspan Corporation was under the Have Raider programme. This was divided into two phases. The first demonstration, Have Raider I, focused on advanced vehicle control. The experimental NF-16D VISTA autonomously flew in formation with a lead aircraft and conducted a ground-attack mission, then automatically rejoined the lead aircraft after the mission was



General Atomic Gambit and its future variants are based on a fuselage that is common to more alternatives. Change of wings and inlets would allow for different task-optimised CCA. Something similar had been done by the Skunk Works between the Lockheed U-2, F-104 Starfighter and the JSF
General Atomics

VISTA
X-62
048
USAF Test Pilot School
In-Flight Simulator

The Lockheed X-62 VISTA over Edwards AFB has been instrumental in evaluating flight control systems for the CCA candidate aircraft and a proving ground for AI flight testing
Richard Gonzales

completed. These capabilities were linked with Lockheed Martin Automatic Collision Avoidance Systems (ACAS) to ensure safe, co-ordinated teaming between the F-16 and surrogate UCAV, the NF-16D VISTA (Variable Stability In-flight Simulator Test Aircraft). Using an experimental F-16 as a surrogate unmanned aircraft, the demonstration proved the ability to autonomously plan and execute air-to-ground strike missions, fly in formation with a manned aircraft and react to changing threat environments.

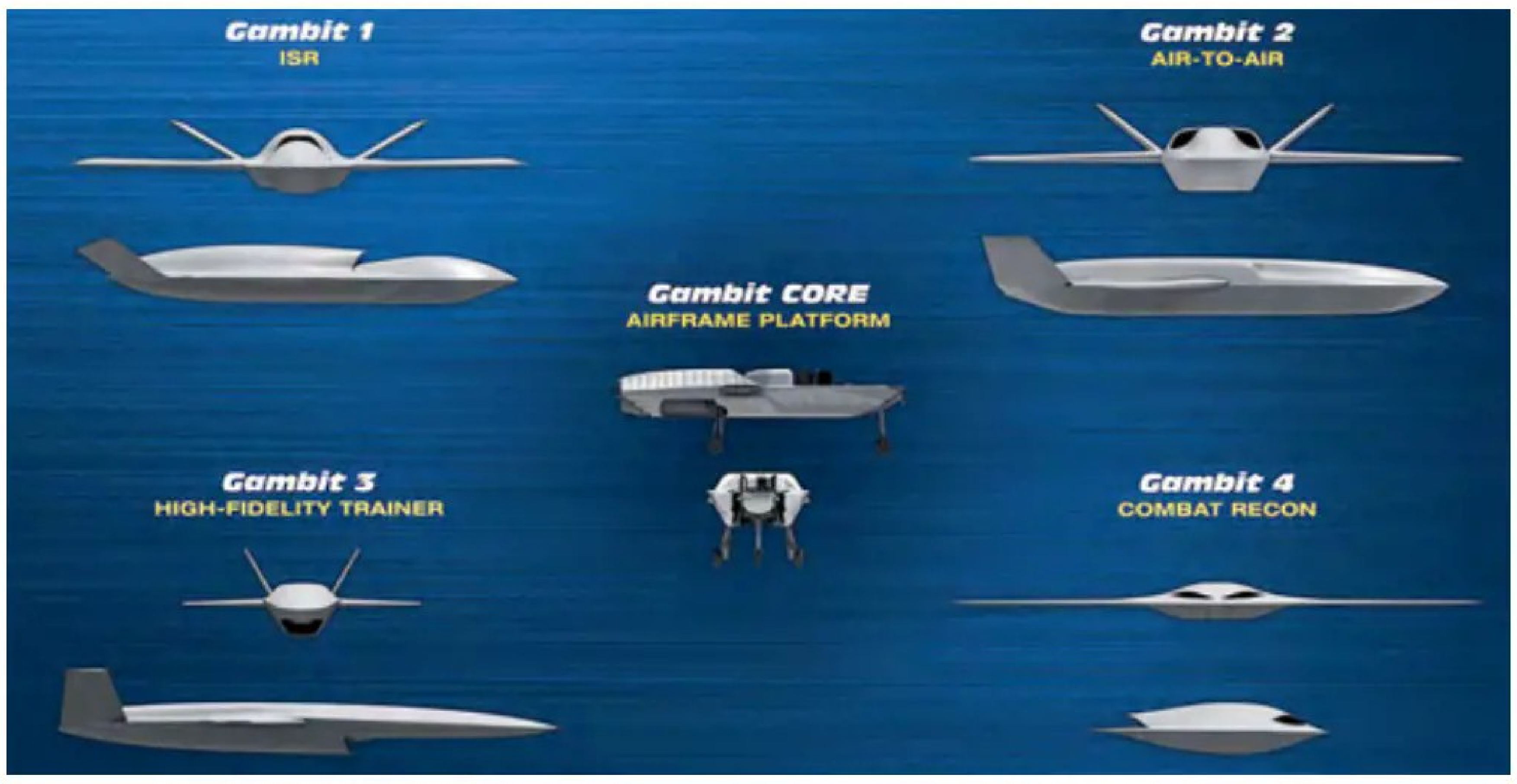
During the second phase the same was tested but this time with Open Mission Systems (OMS) from different suppliers, it was announced April 2017. "The OMS architecture used in Have Raider II made it possible to rapidly insert new software components into the system," said Michael Coy, AFRL computer engineer. "OMS will allow the Air Force maximum flexibility in the development and fielding of cutting-edge autonomous capabilities."

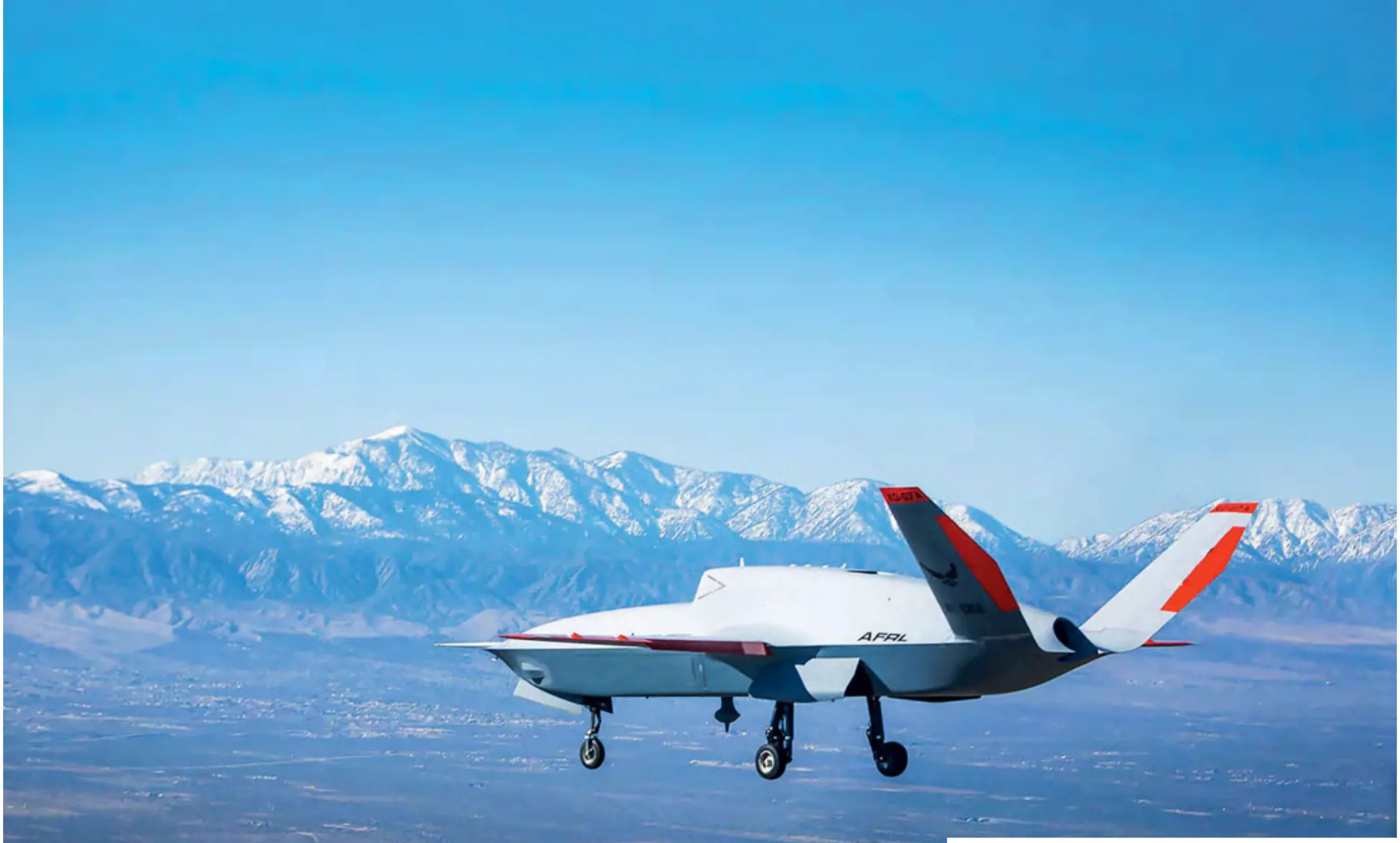
The Skunk Works continued working on autonomy and AI and partnered with the University of Iowa's Operator Performance Laboratory (OPL) to prove new technology. Skunk Works AI directly flew and conducted tactical exercises with a full-scale, live aircraft – one of OPL's Aero Vodochody L-29 Delfin jets – using heading, speed and altitude commands, it was announced in June 2024. The team executed simulated-to-real transfer test objectives against a virtual adversary in offensive and defensive risk postures. Eight test cases were conducted per flight to exercise the L-29 AI agent in a variety of situations, from standard head-to-head fights to off-aspect encounters, missile support and missile defeat scenarios. The team was encouraged to see clean sim-to-real transfer of learned behaviours and that the AI agent appeared intentional and decisive in its actions.

These tests were resumed in November 2023 with the involvement of an extra Aero Vodochody L-39 Albatros with a human acting as a "battle manager" who assigned targets to two AI-controlled L-29 Delfin jets, which then worked together to defeat two mock enemy jets using simulated mission systems and weapons. In total, the joint Lockheed Martin Skunk Works and the OPL team completed 13 test cards over the course of three flights. These flight tests built on previous experiments that demonstrated AI-controlled air-to-ground jamming and geo-location. The tests shifted

Below: ***The Anduril Fury full-size mock up. They are the only candidate not to have any flying prototypes or drones in connection with the CCA but are somehow 'upending' big players in the field***
Matthew C Clouse

Below right: ***A family of drones with the same core adapted for different missions***
General Atomics





The first flight of the XQ-67 which is basically a proving prototype of the concept of the General Atomics' Gambit family of drones

Above: ***A full-scale model of the General Atomics' Gambit that was selected and is due to be in service by 2028***
Matthew C Clouse

Right: ***The Air Force Research Laboratory showing of models of General Atomics' concept of the CCA at the Air Force Association exhibition***
Marc D DeNofio

to AI in air-to-air combat, where AI sends commands directly to the planes' autopilots. This is the third test of this type and the first to include a real-time human battle manager overseeing the actions of AI.

UAV expert General Atomics

Under the Air Force Research Laboratory Low Cost Attritable Aircraft Platform Sharing programme it became imperative that a platform could have the same cheap core with customer specific or role specific specialisation, similar to the car industry. General Atomics was contracted to prove that new manufacturing technologies allowed this to be applied to an aircraft platform. In came the XQ-67 which is considered a next generation compared to Kratos XQ-58. The XQ-67 has a retractable undercarriage and can take off and land. The first flight of the XQ-67 occurred on February 28, 2024. General Atomics will use the basic design of the XQ-67 upgraded for the requirements of the Collaborative CCA. The General Atomics entry is called Gambit and was first presented in March 2022.

The new disruptor

Blue Force Technology had designed its autonomous air vehicle Fury with the aim of replacing the red air mission, rather than as a loyal wingman or for the CCA program. It was introduced by Anduril which had evaluated the flight control software for the Fury in the X-62. So far Anduril has not flown the Fury, but it is due to be deployed by 2028, like the General Atomics Gambit. Anduril is the only company that hasn't designed, developed and sold aircraft.

Endgame

Although roles for the CCA could be unlimited, the cost could be prohibitively expensive, with a potential requirement for 1,000 units. The USAF has been working towards adopting CCA and is aiming to proceed in three increments to keep costs down. In January 2024 it was announced that five contractors had been selected to produce CCA: Anduril with the Fury, Boeing with the MQ-28 Ghost Bat, General Atomics with a derivative of the Longshot, Lockheed Martin and Northrop Grumman with model 437; the big surprise being that Kratos was left out. The Increment I selection was awarded to Anduril and General Atomics by the end of April 2024. Their task is the air-to-air role. The next increment is again open to all competitors as the mission is different – air to ground. A third increment is possible and is highly likely. How the 1,000 CCA are going to be divided over the requirement increments will be interesting to see. **afm**

The Lightning *Grows Fiercer*

Mina Adel assesses the strength of the UK's Lightning Force and how the TR3 upgrades will further increase its firepower

VMFAT-501
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The RAF and the Royal Navy (RN) are preparing to receive more F-35s with TR3/Block-4 upgrades, according to the contract for 48 aircraft or so-called Tranche-1. Of these, 36 have already been received, with the rest of the aircraft to be completed by the end of 2025. The UK has a long-term programme to acquire 138 F-35s, which is an ambitious project to find a balance between quantity and quality in order to achieve the greatest combat effectiveness.

The RN will deploy the F-35 on Carrier Strike Group 25 led by aircraft carrier HMS *Prince of Wales* in the Indo-Pacific region. To counter China's aggression, the new aircraft will have to operate in the most complex battlefield, necessitating superior operational capabilities possessed by these combat aircraft to adapt. In 22 November US DOD has awarded Lookheed Martin a $869,947,066 contract to upgrade the US and non-US F-35 fleet to the TR-3 variant. The upgraded F-35 Block 4 hides a lot of magic that will not only increase the strength of the Fleet Air Arm but raise the combat effectiveness of all NATO and allied air forces.

More advanced means more lethal

On January 6, 2023, a USAF F-35 from the 461st Flight Test Squadron conducted the type's first flight with TR-3, a key development in the future of the aircraft that encompasses dozens of basic improvements to its software and hardware. However, to be utilised, it is necessary to perform an upgrade called Technology Refresh 3 to the aircraft's main computer processor. Besides updating the memory unit, Lockheed Martin describes this upgrade as making the computer 25 times more powerful. Reflecting these improvements, a new panoramic display system has been installed in the cockpit. At the hardware level, the AN/APG-85 gallium nitride (GaN)-based AESA radar is fitted, as well as a significant improvement to the jet's distributed aperture system (DAS) and electro-optical targeting system (EOTS).

The aircraft will undergo extensive physical modifications to accommodate sophisticated electronic warfare (EW) equipment that has not been specified. Also, weapons bay modifications mean the jet can carry more ammunition, probably including up to six air-to-air missiles. This is a significant improvement because externally carried missiles reduce the aircraft's ability to hide and carrying only four missiles is a risk if an opponent has a good defence system and can neutralise at least the first attack from

An F-35B in 809 Naval Air Squadron colours for the recommissioning of 809 at RAF Marham in December 2023 Cpl *James Skerrett/ MOD/Crown Copyright*

A pair of F-35B's from the RAF (bottom) and US Marine Corps take part in formation flying over the east coast of England in July 2016 *SAC Tim Laurence*

an F-35, as happened in the shooting down of a Syrian Su-22 by a US Navy F/A-18 after it was able to evade an AIM-9X Sidewinder missile in 2017. With six missiles, the F-35 pilot has the luxury of carrying out the first and second attack and staying in battle for longer with full effectiveness. Meteor missiles will also play a crucial part in the F-35's ability to engage targets from a long distance because the missile has a range of 130 miles and more energy in its terminal phase of the attack.

Centre forward or quarterback?

The new TR3/Block-4 aircraft has numerous tactical benefits that the RAF needs to realise an effective 'Kill Web', which entails synchronisation between combat formations to develop a comprehensive picture of the battlefield and potential threats, to find the best tactical and armament options to eliminate them. This might entail a Lightning teaming with a Typhoon carrying a large number of different munitions and long-range precision missiles. In the future, AI collaborative combat aircraft (CCA) and an autonomous collaborative platform (ACP) will be integrated in this 'Kill Web', offering many kinetic and non-kinetic capabilities such as guided missiles, ammunition and electronic warfare pods to support combat missions.

To better, understand the role of the F-35 TR-3 in modern warfare, *AirForces Monthly* spoke to RAF Air Marshal (Ret) Greg Bagwell, who was the UK's Joint Force Air Component Commander for Operation Ellamy in Libya in 2011. He said: "As we see increasing use of collaborative drones [loyal wingmen] then the F-35 may become more of a quarterback. I think that's a work in progress, but F-35s are already a critical provider of information to the 'network', as well as being capable of being the most forward asset due to their stealth."

Combat operations of F-35 aircraft are rarely announced, but the Israeli attack on Tehran in October 2024 provided an example of the effectiveness of fifth-generation aircraft in a complex scenario combining drones, cruise missiles and air-launched ballistic missiles to neutralise air defences. It emphasised the importance of long-range weapons, which the RAF is keen to have in the future because they currently depend on Paveway IV precision guided munition, advanced medium-range air-to-air missiles (AMRAAMs) and advanced short-range air-to-air missiles (ASRAAMs).

Bagwell explained: "The F-35 is a very capable platform, where a combination of

A mixed formation from the Ramstein Flag 24 aerial exercise over the Aegean Sea in October 2023 *NATO*

stealth and sensor fusion gives it a great advantage over lower-generation aircraft and air defence systems [as seen over Iran]. But the platform also needs advanced and longer-range weaponry to truly exploit that advantage. So the next important step for the UK is the integration of new UK weapons such as Meteor and Spear Cap 3, which are suffering from delays."

Russian integrated air defence

The war in Ukraine has highlighted the importance of achieving air superiority to secure and enable the air, naval and land formations to operate with no limitations on the battlefield. However, if air superiority fails, this will lead to endless attrition fighting primarily because of the continuous development of the capabilities of eastern anti-access-aerial denial (A2/AD) systems, especially air defences.

According to a paper by the Royal United Services Institute (RUSI) in October 2023: "Russian forces already make widespread use of sophisticated digital radar and EW systems with advanced processing capabilities that can very rapidly alter their signal patterns, energy levels and even frequency bands. This means that not only are they more difficult to detect within the background 'noise' of any battlespace, but they are also difficult to identify from their emission signature and can rapidly adapt their signal to reduce the ability of EW to degrade their effectiveness." Simultaneously, the NATO air command developed new Flag series exercises. The first of these –Ramstein Flag – was held last October in Greece and focused on counter-A2/AD and integrated air missile defence (IAMD).

Many NATO countries and allies own F-35 aircraft, which are expected to play a major part in the task of neutralising air defences.

An Israeli F-35I Adir assigned to 140 Squadron at Nevatim Air Base taxis out for a mission during Red Flag-Nellis 23-2 *William Lewis/Nellis Air Force Base*

The first F-35B Lightning II delivered to the RAF, accompanied by two USAF F-35Bs and two RAF Typhoons in June 2016 *Sgt Peter George/ MOD/Crown Copyright*

Professor Justin Bronk, a senior research fellow for airpower at RUSI said: "The F-35 in all its variants is currently highly effective against both Russian long-range SAM systems and fighters like the Su-35S and Su-30SM2, especially when operating as part of a mutually supporting composite air operation (COMAO). However, it is not invincible, and when available in only limited numbers its effectiveness will depend on what weaponry it is carrying and how well any sorties are synchronised with other cross domain effects."

According to Lockheed Martin, the F-35 has an ideal system for monitoring and evaluating opponent air defences. The autonomic logistics information system (ALIS) "provides the IT backbone and capabilities to support current and future warfighters across the US services and the world. ALIS integrates a broad range of capabilities, including operations and serves as the information infrastructure for the F-35."

The goal of neutralising air defences is dependent not only on weapons but also on the quantity of information you know about the enemy defensive network. The ALIS system will collect intelligence information on enemy radars from all European and American F-35s stationed in Europe, which will then be shared and exchanged to find the best solutions.

Bronk said: "The TR3/Block IV upgrades will significantly enhance the capability of the aircraft further, especially in terms of its electronic support measures (ESM) and electronic attack (EA) capabilities against a wide variety of systems within Russian and Chinese IADS." **afm**

A USAF B2 Spirit with two RAF F-35s in August 2019 *MOD/Crown Copyright*

All at sea

As Iran, Oman and Russia gathered for their first-ever joint naval exercise, other countries watched with interest. Babak Taghvaee reports

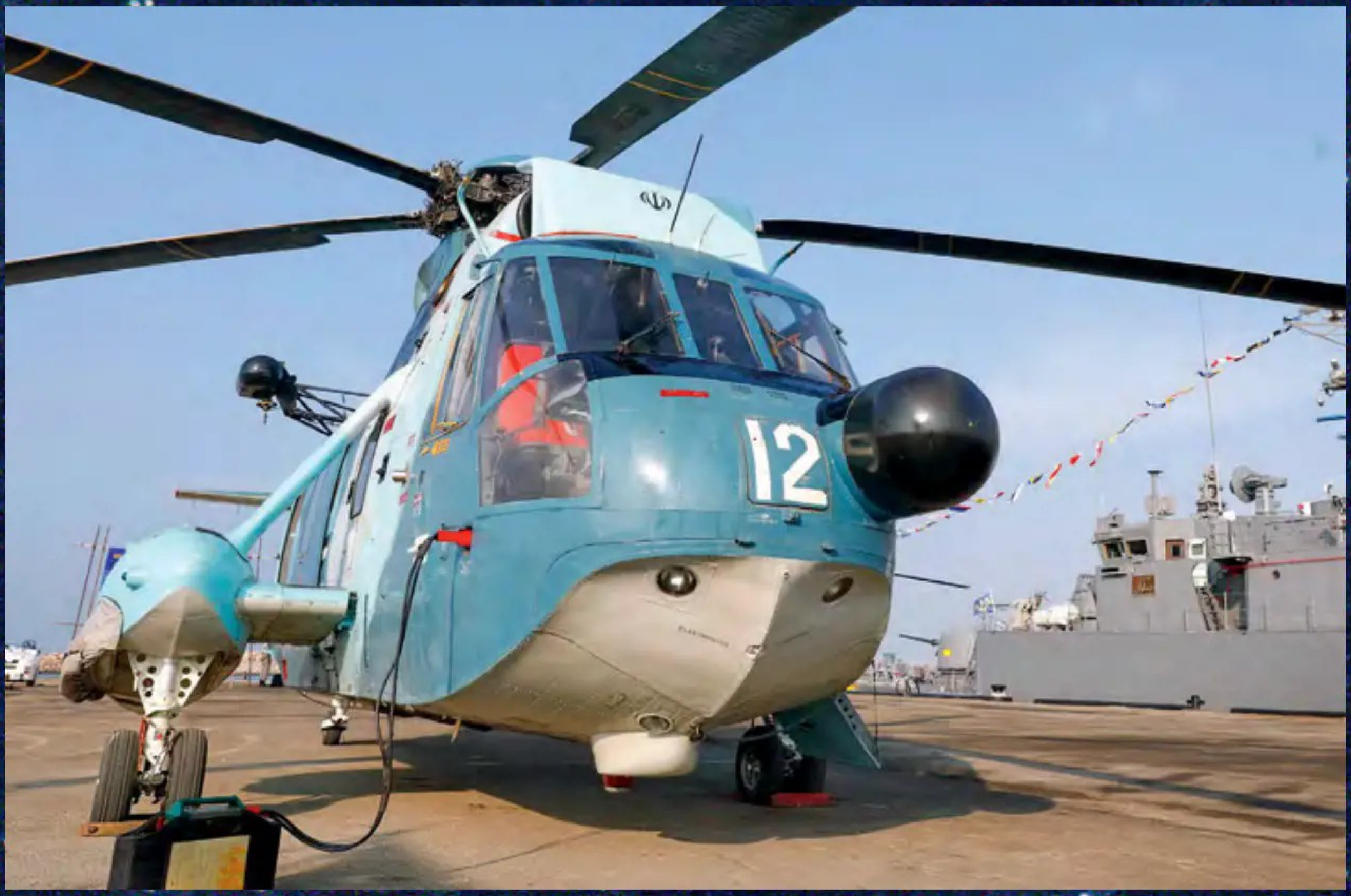
The naval forces of Iran, Oman and Russia participated in a joint exercise in the Oman Sea on October 20, 2024. Named the Indian Ocean Naval Symposium (IONS) Maritime Exercise (IMEX) 2024, it involved ten naval ships and eight helicopters. The IONS was initiated by the Indian Navy in 2008 to enhance maritime co-operation in addressing non-conventional and organised security challenges. The Islamic Republic of Iran Navy, along with the Indian Navy, is responsible for two security committees and a humanitarian response committee within the IONS. They planned to stage the IMEX 2024 under the motto 'Together for a safe and secure Indian Ocean'.

Firefighting and rescue ops

Foreign participants arrived in Bandar Abbas on October 18. The day after, they participated in a conference and visited various cultural and tourist sites in Bandar Abbas and Hormuz Island in the Persian Gulf. The next day, they took part in a one-day exercise in the west of the Oman Sea and near the Hormuz Strait; the naval forces of Russia and Oman were the only foreign participants in the exercise. Additionally, the navies of Saudi Arabia, India, Thailand, Pakistan, Qatar and Bangladesh had sent representatives to observe events.

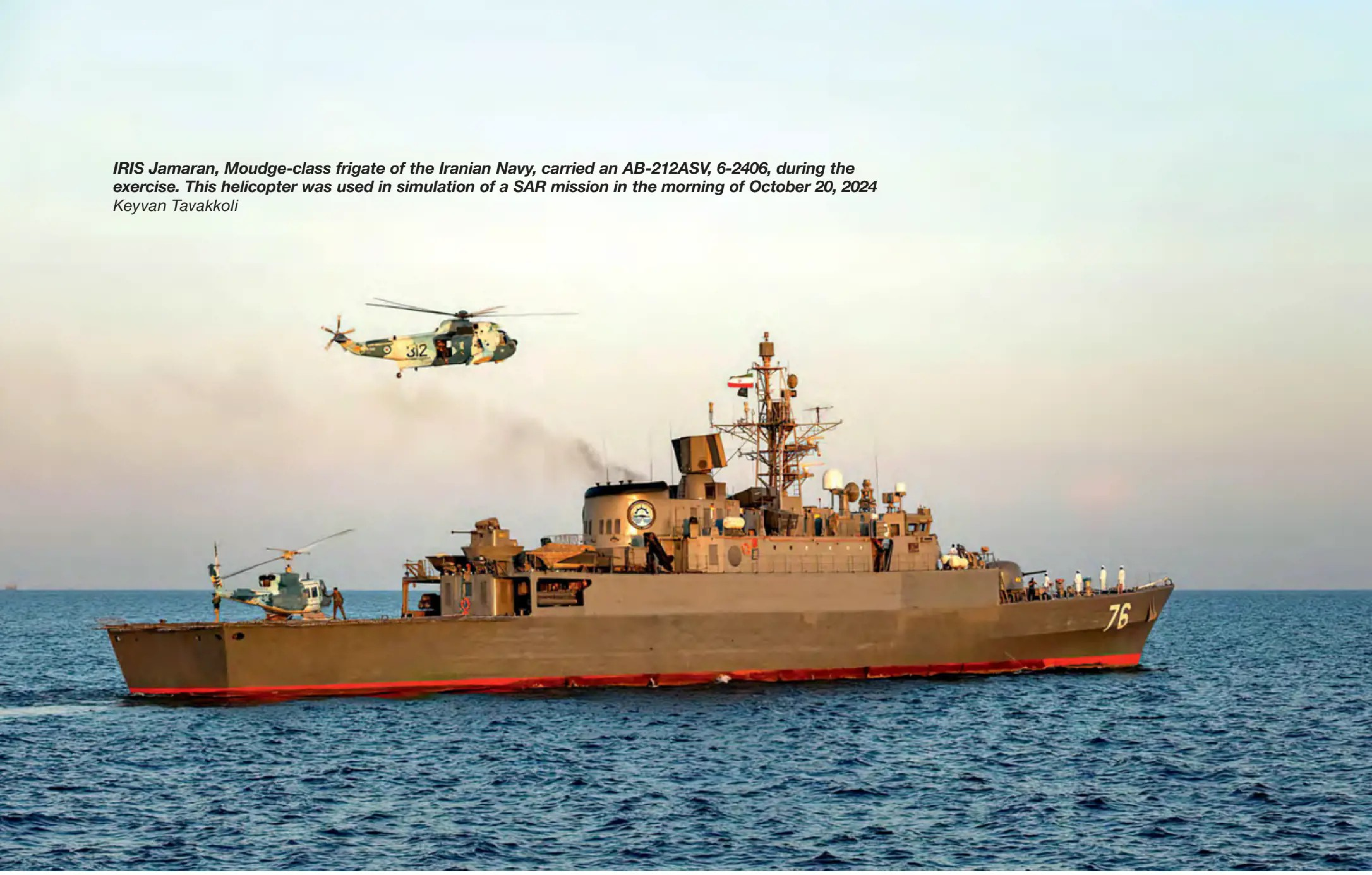
Four Iranian Navy ships and four Islamic Revolutionary Guard Corps (IRGC) Navy vessels participated in the exercise. The Russian and Omani Navies each operated one vessel. The participants were the Sina-class fast attack craft IRIS *Zereh* (P235), IRIS *Bayandor* corvette (81), IRIS *Jamaran* (76) Moudge-class frigate, and the IRIS *Alborz* (72) Alvand-class frigate of the Iranian Navy; *Shahid Mahdavi* (110-3) support vessel, *Shahid Rouhi* (P 313-11) Tondar-class fast attack craft, *Nasserinejad* (116) Nasser-class auxiliary ship and *Shahid Soleimani* corvette (FS313-01) of the IRGC Navy; the *Al Mubshir* high-speed support vessel (S11) of the Royal Omani Navy; and *Merkury* (734), a Steregushchiy-class corvette of the Russian Navy's Black Sea Fleet.

The ten vessels were supported by eight helicopters from the participating forces. They

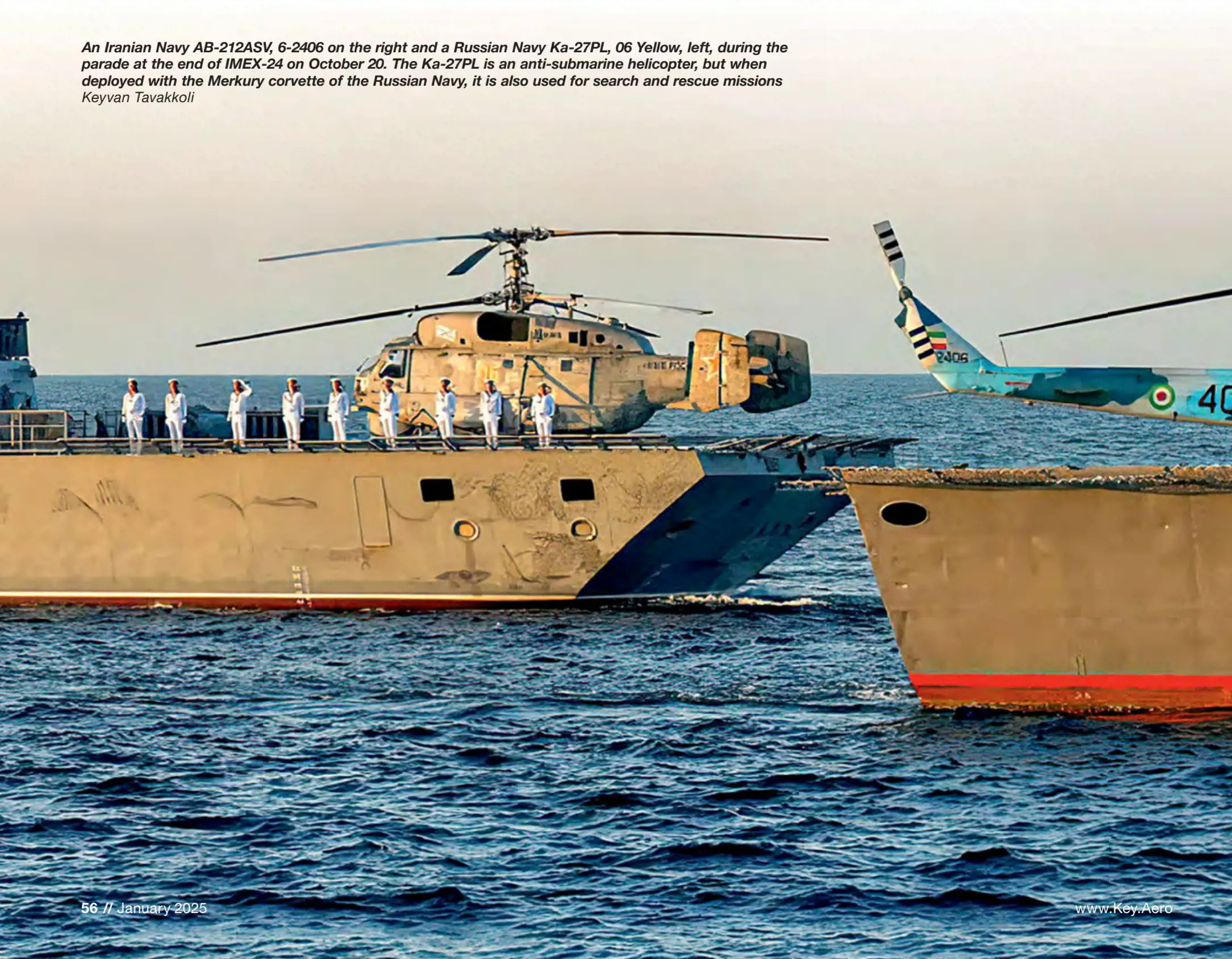


Top: ***The Islamic Republic of Iran Navy Aviation 12th ASW Squadron operates 16 ASH-3D Sea Kings, but just seven are currently airworthy. Two of them, including this search and rescue version, 8-2312, participated in the IMEX-24 directly from their home base, Bandar Abbas Naval heliport. This helicopter was used for airlifting journalists and military photographers during the photography exercise at the end of IMEX-24*** *Ali Naderi*

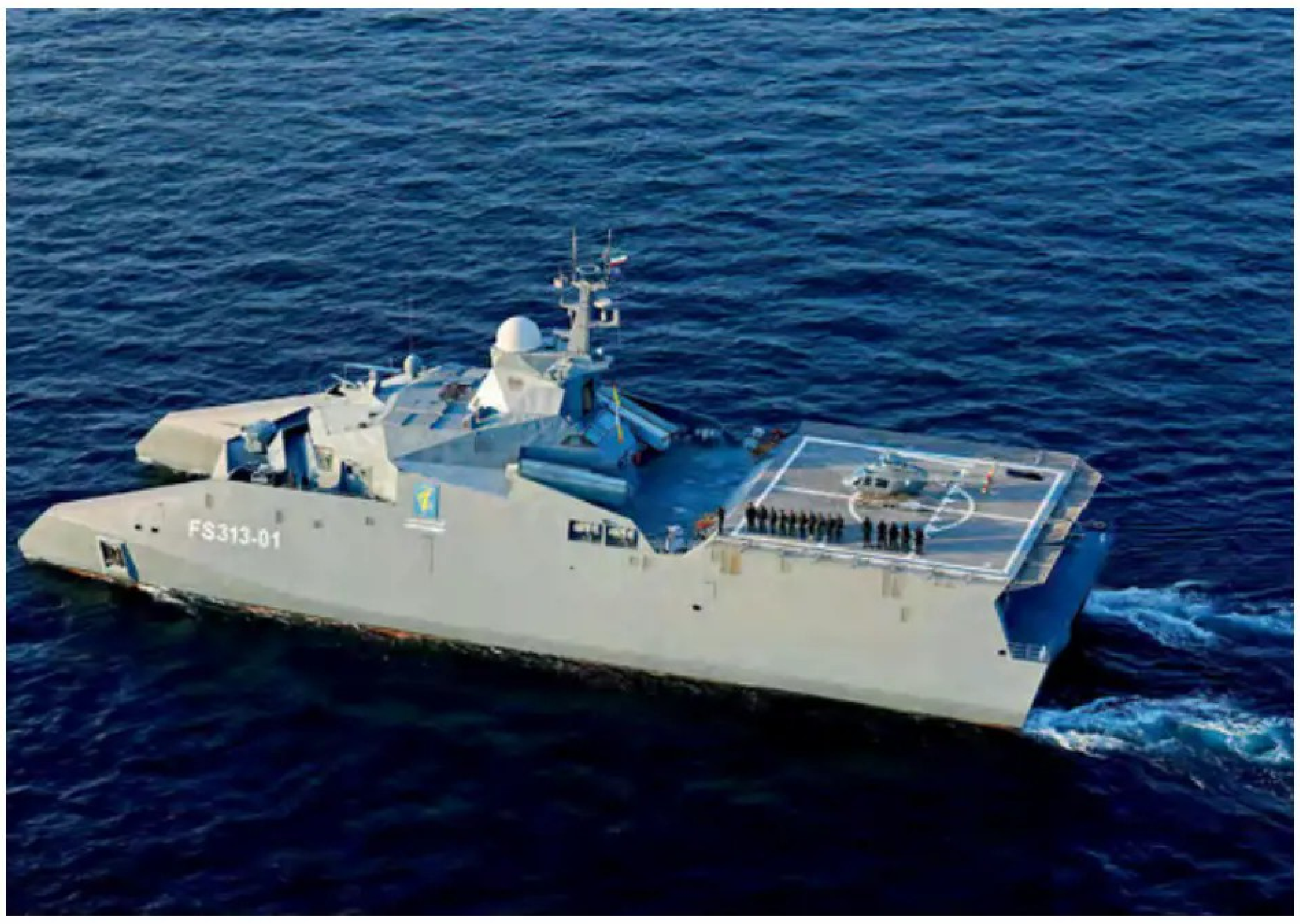
The Islamic Revolutionary Guard Corps Naval Aviation operates five Mi-171s and an ex-Iraqi Army Mi-8MT. Two of the Mi-171s participated in the exercise, including this example, which carried a Bambi Bucket to drop water on a support ship playing the role of a commercial ship on fire *Ali Naderi*



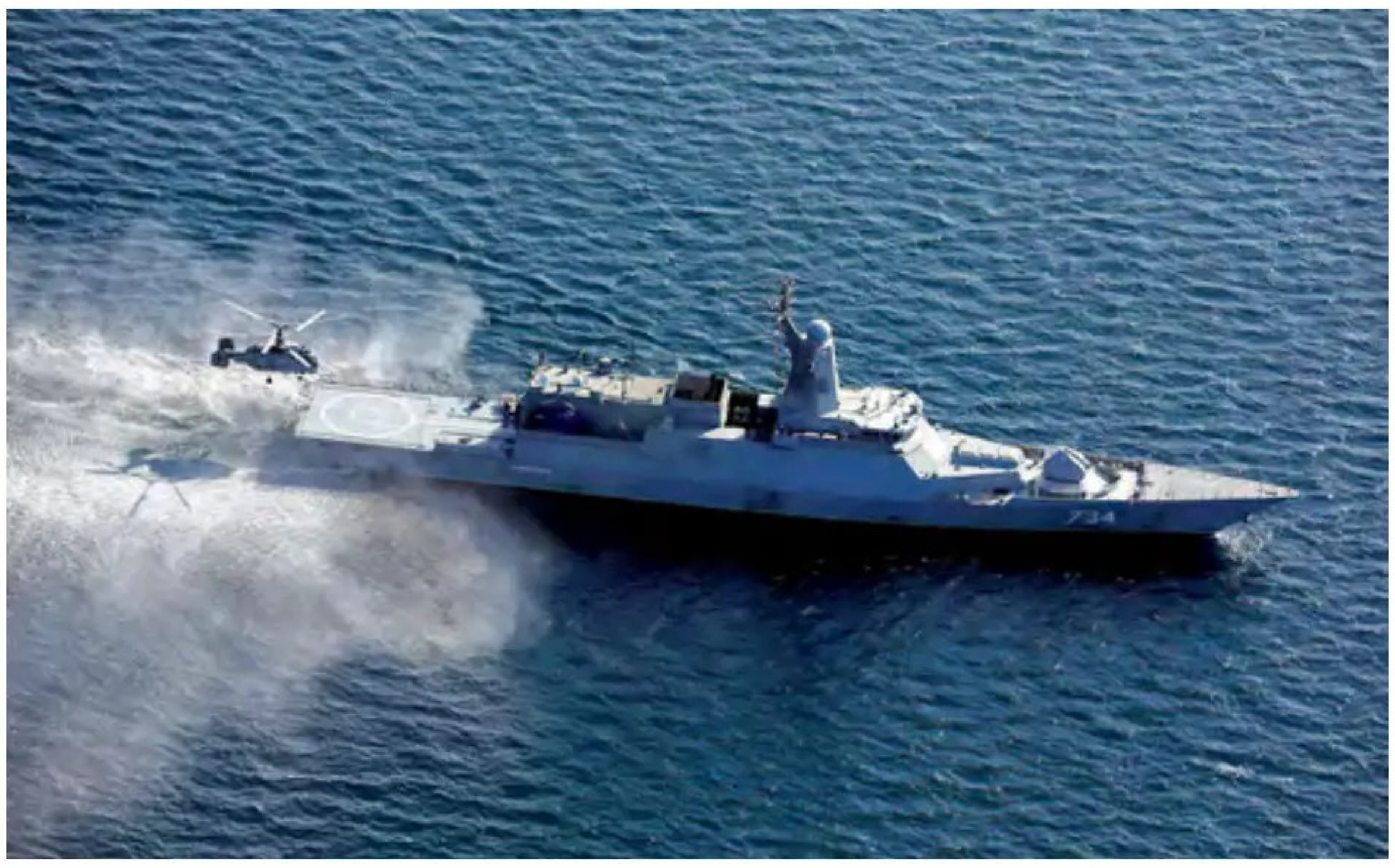
IRIS Jamaran, Moudge-class frigate of the Iranian Navy, carried an AB-212ASV, 6-2406, during the exercise. This helicopter was used in simulation of a SAR mission in the morning of October 20, 2024
Keyvan Tavakkoli



An Iranian Navy AB-212ASV, 6-2406 on the right and a Russian Navy Ka-27PL, 06 Yellow, left, during the parade at the end of IMEX-24 on October 20. The Ka-27PL is an anti-submarine helicopter, but when deployed with the Merkury corvette of the Russian Navy, it is also used for search and rescue missions
Keyvan Tavakkoli



The Soleimani corvette of the IRGC Navy carried an AB-206B equipped with floats during this exercise. This helicopter was used for reconnaissance and surveillance before the start of the search and rescue mission during IMEX-24 *Ali Naderi*



Merkury, a Steregushchiy-class corvette of the Russian Navy was involved in IMEX 24. Having been delivered to the Black Sea fleet on May 13, 2023, it has much of its time since December 2023 bin the eastern Mediterranean because of the Russian Navy's fear it would be attacked by Ukrainian Armed Forces. Intriguingly the corvette and its helicopter has been used to protect Iranian commercial ships from Israeli Navy attacks
Keyvan Tavakkoli

included an Agusta Bell AB-212 ASV of the IRINA's 11th Anti-Surface Vehicle Squadron, 6-2406; two Agusta Sikorsky ASH-3D Sea Kings of the Islamic Republic of Iran Navy Aviation's (IRINA) 12th Anti-Submarine Warfare Squadron, 8-2302 and 8-2312; two Mil Mi-171s of the IRGCNA, SN-2104 and SN-2105; an Agusta Bell AB-206B Jet Ranger II, SN-2304 and an unknown Super Lynx Mk120 search and rescue helicopter of the Royal Omani Air Force's 15th Squadron; and a Russian Navy Kamov Ka-27PL, 'Yellow 06'/RF-19178, from 25th Independent Shipborne Anti-submarine Helicopter Regiment (25 OKPVP) at Kacha, Crimea Peninsula.

The exercise scenarios focused on firefighting and search and rescue. Started on the morning of October 20, 2024, an IRGCNA Mi-171, an IRINA AB212ASV and ASH-3D, an ROAF Super Lynx Mk120 and a Russian Navy Ka-27PL flew over the area of the exercise searching for two support vessels of the Iranian Navy and IRGC Navy, which played the role of two commercial ships in distress. After detecting them, the helicopters performed winch operations above then returned to their ships, the *Shahid Mahdavi* support vessel, *Merkury* corvette, *Jamaran* and *Alnvand* frigates and the *Al Mubashir* high-speed support vessel.

After that, one of the Iranian Navy's support vessels played the role of a commercial ship on fire – it transmitted a distress signal and exercise participants rushed to its location to rescue its sailors. One of two Mi-171s of the IRGCNA aboard *Shahid Mahdavi* carried out the firefighting operation using a Bambi Bucket to pick up and drop sea water on the deck of the support vessel.

France and the US watched

The Escadron de reconnaissance 4/33 (Reconnaissance Squadron 4/33; RC 4/33) 'Périgord' of the French Air and Space Force utilised a SAAB 340B Electronic and Signal Intelligence (ELINT/SIGINT) aircraft, N441FF, chartered from Aircraft Guaranty Corp Trustee while the US Navy used a Boeing P-8A Poseidon maritime patrol aircraft (MPA) to monitor exercise participants. The crew of the SAAB 340B, which had arrived at Al-Dhafra Air Base. UAE, on October 13, performed this task as part of its routine mission to monitor activities of the Iranian Armed Forces in support of the French-led operation European Maritime Awareness in the Strait of Hormuz (EMASoH).

While the French SAAB 340B operated from Al-Dhafra, the US Navy's P-8A flew this mission from Shaikh Isa Air Base in Bahrain as part of its daily mission to monitor Iranian and IRGC naval activities in the Oman Sea. The information gathered by the aircraft was transmitted to the US Navy's Fifth Fleet headquarters in Bahrain and was also shared with US Navy vessels and other ships involved in the mission or operation EMASoH. For safety reasons, the aircraft monitoring at IMEX-24 flew within 5km of the exercise, following NOTAMs issued by the Iranian Civil Aviation Organisation.

IMEX-24 is one of the joint Iranian-Russian naval exercises that have been hosted by the Iranian Navy in past years. Naval forces of Pakistan and China are also routine participants in these exercises. However, the involvement of the Indian Navy in the organisation of IMEX-24 resulted in the absence of both during this exercise.

These exercises also help Russia and China increase their hegemony in the region's international waters of the with the hope of taking the place of the US Navy in the future, following US plans to reduce its presence in the region by the end of the decade. **afm**

The Ultimate Test

Before attempting to land on an actual carrier, French Navy pilots must first pass through the Simulated Carrier Landings on Runway, known as ASSP (Appontage Simulé Sur Piste in French), in front of the landing signal officers (LSO). Bruno Etchenic travelled to Landivisau to witness the action

Late afternoon in the 12F briefing room. Eight young pilots, aged 23 to 29, wait for the arrival of the carrier landing officers in near-religious silence. Freed from their impressive flight suits that give them the characteristic air of modern-day knights, they once again appear simply human in our eyes as observers. Stripped of their bravado, we see eight students nervously awaiting the results of the exercise, trembling in a reverent hush.

The day before, when I asked Thibault, one of the young pilots, whether the thought of a real carrier landing at sea made him apprehensive, he replied that it was merely the culmination of hard work done beforehand. In this case, they must succeed in the ASSP, and the final boss is the 'LSO' – landing signal officer.

The final boss

This expression was used by three pilots I interviewed during various conversations and this shared language is a sign of the strong common culture within the squadron. The 'final boss' is a term borrowed from geek video game culture. It represents the ultimate adversary, the most respected and difficult to defeat–the one who, once overcome, will bestow the final reward, the greatest possible honour. But it is also the one whose defeat signifies nothing but death. This symbolism comes into full play as soon as the first words are uttered by Corvette Captain Justin, the "boss among bosses" within the community of carrier LSOs, assisted that day by Lieutenant Adrien (full names withheld). Harsh words were expected. Though young, these pilots already know their craft; they are well aware of their own limits and do not wait for the verdict before engaging in self-criticism. In the aviator's profession, mistakes are part of daily life. One must know how to recognise, control and correct them. When handling such machines in a combat environment, sweeping errors under the rug would sooner or later lead to death – for oneself or others.

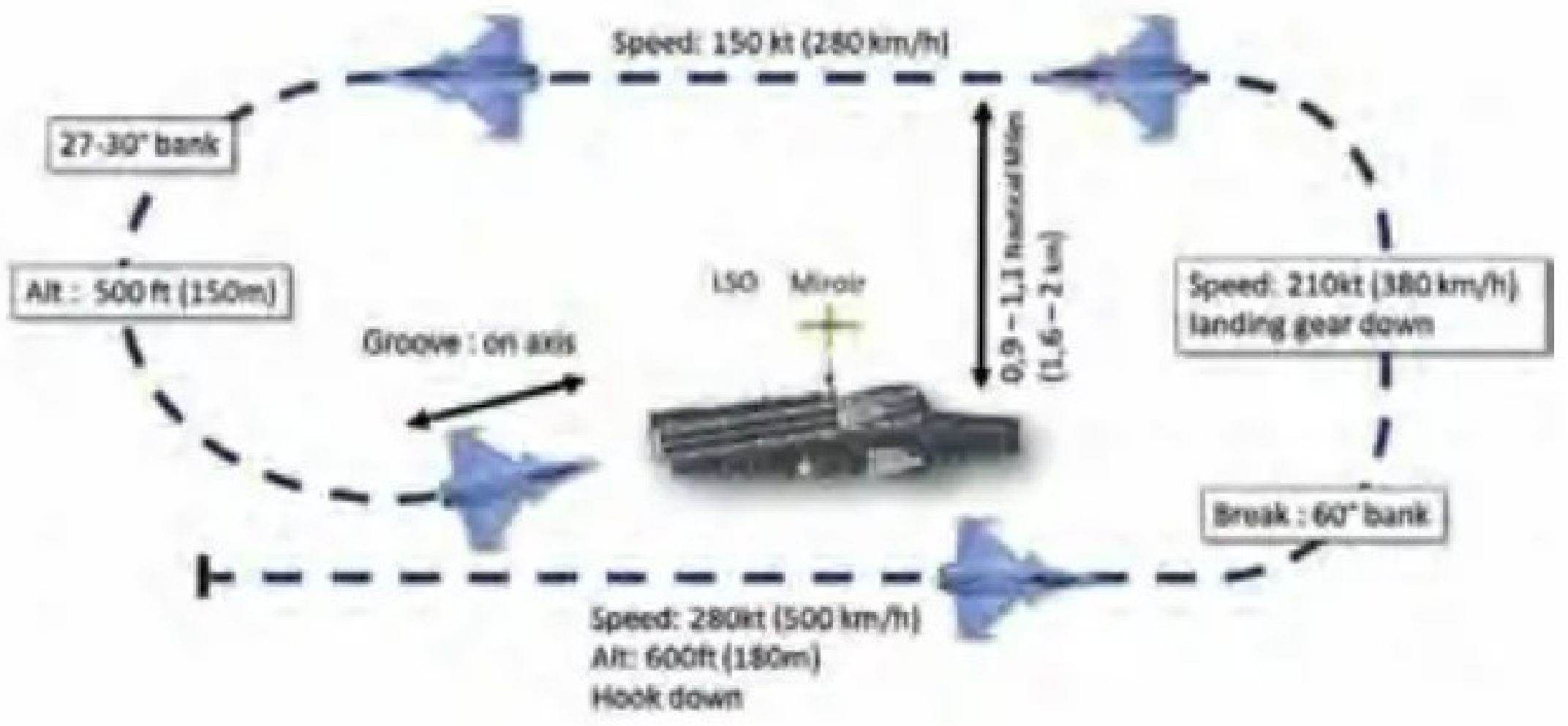
The "final boss", because regardless of the rank of the pilot at the controls, the LSO always has the final word, and that impresses the young student pilots greatly. Nevertheless, Capt Justin doesn't like the term. To him, the most important factor is the performance level of each pilot. He must bring them to an adequate level if they want to board, and he is there to guide them. Applying pressure is part of the game because they will have to learn to manage it, but failures are very rare and are seen as a collective failure.

Guardians of the ramp

Carrier landing is not, as the overused expression goes, a mass sport, and for good reason! The pilot must arrive with a perfect glide slope, most often controlled using the landing mirror, where the angular precision between each 'ball' is only 0.13°. While maintaining the slope, the pilot must also aim for the centreline with extremely narrow room for error, given the approach speed, which is close to 140knots, or 260km/h. If the tailhook catches the arresting wire more than 1.5 to three metres off the centreline, the hydraulic presses under either

The French navy has started to upgrade all its Rafale fleet to the latest F4 variant
All images Bruno Etchenic unless stated otherwise

Rafale MARINE
F4
CEPA : The future of NAVAL AVIATION
MARINE


Speed: 150 kt (280 km/h)
27-30° bank
Alt : 500 ft (150m)
Groove : on axis
LSO
Miroir
0,9 – 1,1 Nautical Miles (1,6 – 2 km)
Speed: 210kt (380 km/h) landing gear down
Break : 60° bank
Speed: 280kt (500 km/h)
Alt: 600ft (180m)
Hook down

side of the deck, which act as brakes, are not engaged evenly, leading to additional wear or even breaking the wire. Beyond three metres, the wire is considered lost. Beyond six metres, the aircraft will hit the deck in an unreinforced area, potentially causing structural damage to the aircraft carrier.

If the glide slope is too low, pilots put themselves in danger and could strike the stern ramp of the deck, named "arrondi" in French. This should not be confused with the other meaning of arrondi, with the flare performed by land-based pilots before touching down, where the nose is lifted to

Before taking off, every pilot respectfully salutes the LSOs *Alexandre Hartmann*

This picture shows how close we were to the runway

Below Right: ***Observe the shape of the Rafale and the landing gear. Activity on the base was massive; in addition to ASSP, regular training was ongoing***

The pilot focused on the 'meatball' up to the last moment *Alexandre Hartmann*

LSO at night, with only a tiny red light to not obliterate his night vision

The parking is still wet, and the sun manages to find a path through the clouds. Perfect time to jump into the cockpit!
Alexandre Hartmann

After each pass, a few notes are written into the famous landing logbook. It wasn't hot this night. But I was told: "Imagine in January in the cold rain..."
French Navy

reduce descent rate and gently touch the ground. Carrier pilots are not fans of the "kiss landing" favoured by land-based aviators. Instead, it's more appropriate to speak of the "impact" rather than the "touchdown" of the wheels. I think this explanation is necessary to highlight the delicacy of another name given to LSOs, and what could also be considered a subtle play on words: the "Guardians of the Ramp" or "gardiens de l'arrondi".

If the glide slope is too high, the aircraft could hit the deck with excessive vertical speed, causing severe damage and very likely fatalities, given the masses and speeds involved. Ensuring that both the airframe and the pilot return in one piece, without damaging the aeroplane or the ship while maintaining the safety of the crew on board is the heavy responsibility of the LSOs, which explains the rigour of training.

Failing to defeat 'the boss' means death. 'Death' for a navy pilot means being deemed unfit to land on the carrier. The LSO noted in his introduction that while a margin of error is accepted, after several ASSP sessions, they should be performing at a higher level. The ship won't wait, and those who don't pass the test won't remain navy aviators, as their reason for being is to operate from the sea. It's a hard truth to hear and even harder to accept... While many individuals might be crushed under the weight of such judgment, the debriefing continued. We were then able to witness the resilience of these students. Each received feedback on their actions, and the discussions were very constructive. The exchanges between the two LSOs and the students reflected a form of mutual respect. The pilots' responses to the LSOs' precise questions did not lead to any dispute. If doubt remained, they offered to review the recording, which would be the ultimate witness.

Carrier quals

This debriefing confirmed my profound ignorance of the French Navy's world, after the few interviews I had with trainee pilots the day before. The ASSP is not just 'simple' training before the real carrier landing. Simulated runway landings reproduce the entire approach phase from the initial break over the carrier, followed by the approach circuit, the various turns, the descent to the glide slope and the centreline alignment. The carrier landing is, in some ways, merely the crowning achievement of difficult training.

This year, eight pilots are undergoing initial carrier landing training, a higher-than-average number. But it's also more experienced pilots who need to qualify for night landings to obtain the famous 'owl' designation. Some pilots, if they haven't performed a night landing in a while, must redo the night ASSP; this is referred to as getting "pumpkined", a reference to Cinderella losing her carriage after midnight. The life of a navy pilot is certainly no easy ride...

Many other qualifications depend on the LSOs. Generally speaking, they are the guardians of the safety of landing operations within the GAé (Groupe Aéronaval, or carrier battle group), far beyond the direct supervision of the landings they witness. They explained to me, for example, that they are working on creating a new standard to extend the maximum flight hours allowed for night landings on a Hawkeye. They collaborate with experienced crews, taking many factors into account, including human sciences such as stress management, concentration and fatigue, to extend possibilities while staying within safe operational limits.

The image of 'the boss' also carries another meaning: that of the figure who has mastered their craft to perfection. After observing several ASSP sessions, listening to the debriefings and hearing the pilots speak, there is no doubt that the LSOs are, for all pilots, the ultimate figure – beyond even the paternal figure – divine might be a more accurate description, to which they cling.

In God we trust...

Under normal conditions, aircraft carrier approach procedures allow the recovery of a large flight deck of 15 aircraft in total radio silence. But when weather conditions worsen, visibility deteriorates, the wind rages and the sun is absent (a typical day in Brittany, one might say), the LSO's voice becomes the absolute guide. A few words to announce the start of the approach, and the pilot is reassured: they can let themselves be guided; they have blind trust in the LSO. The LSO is trained, qualified and knows the pilot's strengths and weaknesses, knowing exactly how to speak to them.

This trust is built from the very first ASSP sessions, in the harshness of the early debriefings. The LSO speaks the truth, without sugarcoating; it's a truth that's not always easy to hear, but necessary. No false encouragement or unnecessary niceties; what must be said, is said. If the LSO says they are satisfied, it means they truly are – end of story.

This trust is built in both directions, to everyone's benefit. Thus, the LSOs need to know if the trainee will respond to all their commands, no matter what, even – and especially – if they seem counterintuitive.

I witnessed a near-perfect approach when the LSO activated the wave-off signal and called for an immediate go-around. In the pilot's mind, there's no question of analysing why a go-around was requested or whether

Rafale M, 7, on its way to take off. This special delivery for the Nato Tiger Meet is still there and good for us! It's nice among all this grey all day long
Alexandre Hartmann

The light, the rain and the very particular shapes of this aircraft... I'm in love!

Flames of the afterburner provide a very special spectacle for us to enjoy. Even at night, we witnessed scramble-like take-off of up to 12 aircraft in minutes, or about 30% of the total Rafale M fleet in the French Navy

they did something right or wrong. The LSO commands and the pilot executes without hesitation. This is one of the most sought-after qualities: blind, instant obedience. It's also about conditioning the brain to a near-reflex level – from the ear to the throttle, without passing through consciousness.

In real conditions, situations can degrade quickly. The LSO knows the situation on the deck, and there are a thousand and one reasons to ask a pilot to interrupt the final approach, up to the last moment. The pilot responded promptly to the order from the LSO, and this will be emphasised during the debriefing. Knowing that the pilot will obey against all odds establishes an important channel of trust between the LSO and the pilot, in both directions.

Night ops

As the ultimate guarantors of operational safety on board, they are also the beacon in the night guiding the sailors returning aboard. They are few but essential. Without them, and despite all the automation and safety systems on board the aircraft and the ship, aerial operations would simply be unthinkable.

For night approaches in long final, the controller guides the pilot via radar down to 350ft, then the pilot makes their mirror call, and the LSO takes over to guide them if necessary, sometimes as early as 600ft altitude if they judge that the deviation is too great for the pilot to correct themself. But if everything goes well, the LSO does not intervene and lets the pilot manage their approach.

Returning at night, without moonlight and visibility, when the sea is black and sea and land blend together, pilots are guided by controllers until the point where they are supposed to see the ship, sometimes only a few nautical miles away. In very degraded conditions, the ship is still not visible, and the lights from the mirror are absent. At 140knots, at only 600ft, it is the voice of the LSO that will help them maintain their course and guide them down to the impact.

Add to this already relatively uncommon exercise the possibility of an engine failure, or certain on-board equipment malfunctions that further complicate the manoeuvre, and you will understand why the bonds that unite pilots and their LSOs are both strong and complex, evolving rapidly once the trainee faces the ultimate qualification challenge: landing on the ship. Indeed, LSOs continually monitor the performance of pilots over time, particularly by consulting the landing logs.

At sea, I am told the bond is heightened in the community of pilots who experience extraordinary events that others cannot envision –– that of course usually includes the family which can often be frustrating for the pilot. **afm**

Intense activity on the Landivisiau Naval Air Base. For each session, two blocks of four aircraft and one of two followed each other, realising six passes each, twice a day, sometimes during the night, for weeks. The navy tries to manage neighbours' complaints

10
SAUVETAGE

Belgi dinosaur

Spare "Stay Eighteen"
RESCUE
TURN HANDLE
SLIDE CANOPY

In the late 1960s, the Belgian Air Component received their first SIAI-Marchetti SF.260s. Sven van Roij spoke to **LtCol Jean Van Hecke**, team leader of the Red Devils display team and the world's most experienced Marchetti pilot, about his career.

LtCol Jean van Hecke climbs away from the runway of Beauvechain AB with his SF.260Ms
All images Sven van Roij

um's

ST-18
NO PUSH
LH TIP DRAIN

To replace the Stampe & Vertongen SV-4B biplane, the Belgian Air Component placed an order for 36 SF.260Ms at SIAI-Marchetti in January 1969. Later that same year, the first 'Mike' was delivered. Instead of a fully Instrument Flight Rules (IFR)-equipped elementary trainer, an aircraft with the same ergonomics of the ones in operational service was chosen.

1LtCol Jean Van Hecke, who has accumulated 8000 flying hours on the type, said: "Mechanical engineer and aeroplane designer Stelio Frati drew a fantastic aircraft. His starting point was to develop a trainer that could prepare future pilots for the fighter of that period – aircraft such as the Dassault Mirage 5, the F-104 Starfighter and, later, the F-16 Fighting Falcon. For the first 20 to 30 years, our air component had a great training structure. Future pilots started their training on the Marchetti, followed by the Alpha Jet, to prepare to move on to the F-16."

In December 1990, the Belgian government ordered nine additional SF.260Ds to supplement a number of lost aircraft. The 'Deltas' were delivered between February and June of the following year. The SF.260Ms had been equipped with the Lycoming 0-540-E4-A5 engine, but the Delta featured the Lycoming AE10-540-D4A5, both air-cooled with six horizontally mounted cylinders producing 260hp. Van Hecke noted: "After the final deliveries, our aircraft received a cockpit modernisation. We were able to replace some instruments and installed a GPS in the aircraft. With that, the Mikes reached their limit. Receiving the nine SF.260Ds in the 1990s allowed us to start instrument flying and train students in IFR. We had a good combination with two different aircraft, both in terms of cockpit equipment, weight and performance."

For the purpose of their IFR-role, the Deltas were equipped with a bearing distance heading indicator (BDHI), a horizontal situation indicator (HSI) and VOR/ILS to allow runway approaches on instruments.

A four-ship of Marchettis turn over the Lion's Mound, the memorial to the Battle of Waterloo

Current ops

Today, the Marchetti fleet is part of the Belgian Air Component Competence Center Air (CC Air). The Basic Flying Training School (BFTS) operates with about 200 employees from Beauvechain Air Base, east of the Belgian capital of Brussels. Van Hecke explained: "Two squadrons are operational within the BFTS. The 5th Squadron (Egyptian Falcons) performs basic training with our new student pilots. In addition, the 9th Squadron (Green Cocotte) provides the flight skills maintenance of our staff. For the purpose of instrument flying and navigation flights, they make more frequent use of the Delta version of the Marchetti."

According to Van Hecke, the number of instructor pilots (IPs) within the units varies: "We have about a dozen IPs on the organic table, including our commanding officers. We also employ a few non-organic pilots with IP qualifications, either on staff or working at the airbase. This means we have about 20 IPs available in total. In practice, this number varies. After all, someone with a staff position is not always available to fly with a student pilot.

"Today, the 5th Squadron receives one class on an annual basis, consisting of a mix of students. At the end of May, we welcomed

Van Hecke: "If we are going to have access to a turboprop engine aircraft, we will be flying above flight level 90. Our training area will then shift towards the south of Belgium"

13 students on 13-year contracts. Around eight pupils from the Royal Military School in Brussels joined us last summer. They go through the first two phases of training with us. During their initial training, the class will fly 60 sorties. These include basic flying skills, visual flight rules (VFR), instrument flight rules (IFR), aerobatics and military approaches. Also included are eight formation flights, eight navigation flights and five flights with combined profiles. Since the Marchetti is not easy to land – especially not in a crosswind – we take the time to keep our trainees at a safe level. After 24 sorties, students will fly their first solo. After this phase, a decision is made on which type the student will fly.

"We decide who has the best chance to become a fighter pilot. Normally, eight people are selected for the Euro-NATO Joint Jet Pilot Training Program (ENJJPT) in Texas. Of those eight, five or six continue to the Operational Conversion Unit (OCU) to become F-16 pilots."

The OCU was established in 1987 to provide the basic conversion for all young pilots and tactical training for future fighter pilots. Housed at Kleine-Brogel AB since 1996, the facility has limited training capacity available and can convert up to six pilots per year on the F-16: "The one or two who succeed at ENJJPT but do not have the opportunity to advance to the OCU, will probably move on to transport. Those who are not designated for ENJJPT either go directly to transport or rotary."

Thrilling side job

When Jean Van Hecke finished his four-year course at the Brussels Royal Military Academy (KMS), his pilot training on Marchetti started at Goetsenhoven Air Base. He then went through Advanced Flying Training and Initial Operational Training on Alpha Jets at Brustem Air Base. Both air bases for initial training have since closed.

Starting in 1987, he flew for three years on the F-16 with 349 Squadron: "At that time, there were almost no career officers in flight training. Although I didn't want to leave 349 Sqn, I was assigned to SF.260s. In the beginning, I was not so satisfied to become an instructor-pilot on Marchetti. Nevertheless, very quickly I found my place and since then I have enjoyed it very much."

The experienced instructor continued to look for new challenges, which he found in 2016: "In the winter of 2015, our squadron had a problem. One of the display pilots of the Red Devils display team had left and we had to find a fourth pilot. About five candidates applied for the position. After a day of interviews, my commander informed me that no suitable candidate had come forward. He turned to me and asked me if I aspired to the position. So in January 2016, I decided to join the Red Devils.

"For my first two years in the team, I flew as number two. The third year I took position three. Given my age, I needed to resign in 2018. However, due to staff shortages, HR

The Red Devils only use the Mikes, since the type is lighter in weight and more manoeuvrable

decided to ask me to remain in service. Since then, I have been flying as the team leader of the Red Devils on annual contracts".

Van Hecke's primary job remains working in BFTS Standardisation and Evaluation (Stan/Eval).

One of the highlights of Van Hecke's Red Devils career was a flight during the 2018 World Cup semi-final between Belgium and France. "We had the opportunity to fly over the Grand-Place in Brussels – normally a No Fly Zone – with a formation of the Red Devils. The plaza was completely red-coloured. Our national football team is also called the Red Devils, which made it a special moment and a unique experience."

Still a useful tool

The Belgian Air Component currently has a modern fleet at its disposal, including the Airbus A400M, Dassault Falcon 7X and NHIndustries NH-90. In addition, the Belgian armed forces expect to receive the first Lockheed Martin F-35A next year. Achieving initial military pilot training with a relatively old type like the Marchetti- SF.260 might seem incongruous. Van Hecke takes a different view: "The goal of our training is to move forward with the assurance that a candidate possesses a profile appropriate to a future military pilot. The Marchetti is still a good screener for trainees and extremely suitable to do basic training.

"We still have seven or eight Mikes and four Deltas in service. Depending on the training goal, a type is chosen to fly with. The Mike and Delta versions are not very different in external features, but they are in terms of cockpit layout, equipment and weight. For IFR-flying, the Deltas are equipped with extra instruments, which adds extra weight. It doesn't make much sense to fly a spin or a full aerobatic sequence with an 'overweight' Delta. That's why we only use the Mikes in the Red Devils, since the type is lighter and therefore more manoeuvrable. We have stopped carrying out major maintenance cycles, which had to be performed every 500 flight hours. This means the aircraft we now have available will continue to fly on their remaining potential. Once an airframe reaches its 500-hour limit, it is phased out. We still do minor maintenance and the 25-, 50- and 100-hour inspections."

The Red Devils are led in this formation by a precursor, the Fouga CM-170 Magister

Future

Despite the suitability of the type there is a need to provide more capabilities in basic flight training, so a fleet renewal is necessary, due to the aircrafts' ageing systems and a lack of spare parts: "The Marchetti has not been produced for some time, which makes parts harder to come by. We recently had an aircraft that stayed in the maintenance hangar for almost a full year because we couldn't find a replacement flap actuator."

In the search for a new trainer, a delegation of the Belgian General Directorate of Material Resources (DG MR) and the Belgian Air Component visited the Austrian aircraft manufacturer Diamond in Wiener Neustadt in late October 2020. The Diamond DART 550 (Diamond Aircraft Reconnaissance Trainer) was test flown. Sometime later, Belgian Defence Minister Ludivine Dedonder reported that the Marchetti-fleet had to be replaced by 2023 at the latest. However, a contract failed to materialise. Both the Belgian Ministry of Defence Security, Service, Technology, Ambition and Resilience (STAR) and the updated Belgian Strategic Vision 2030 no longer provide information on the future military trainer fleet.

Van Hecke commented: "The future calls for a turboprop aircraft with more capacity, modern avionics and increased performance, such as the Beechcraft T-6 Texan II or the Pilatus PC-7 MKX. With the arrival of such a type, the ENJJPT T-6 syllabus could be run in-house in the future. That would mean we would fly more hours with the trainees in Belgium, to have more assurance on their capacity and profile. This would give us more control over the output of students we send to ENJJPT. We cannot achieve such control with the Marchetti."

The new fleet will consist of about a dozen aircraft and will not be owned by the Air Component, but supplied on a lease agreement. As a result, maintenance and logistics will be performed by an assigned company and the aircraft will be equipped with civilian registrations. Flight training will continue to be carried out by military IPs.

In addition to the arrival of a new type, the infrastructure of Beauvechain AB will also receive a much-needed upgrade. In the process, several simulators will be built. Van Hecke explained: "The simulator or link trainer for the Marchetti has very few capabilities. With the new system we are going to make much more use of simulator training.

"If we are going to have access to a turboprop aircraft, we will be flying above flight level 90. That brings another challenge, since the areas around Brussels Airport and Charleroi Airport use a large part of our airspace. Therefore, our training area will shift towards the south of Belgium. A new type brings better training possibilities but also more transit time per training flight."

For now the Air Component is waiting for the new elementary trainer for IPs to be commissioned. As for Van Hecke: "I will retire as soon as the Marchetti is phased out. For me, flying will be done, although I've heard there might still be places for simulator instructors." **afm**

LtCol Van Hecke at the controls: "The Marchetti is still a good screener for trainees and extremely suitable to do basic training"

During their initial training, students fly 60 sorties, learning basic flying skills, visual flight rules, instrument flight rules, aerobatics and military approaches

Chasing the golden Phantom

The Turkish Air Force celebrated the 50th anniversary of its F-4 Phantoms in November. Cem Dogut looks back at this iconic aircraft's history in Turkish service and shares photos from the celebratory flying events

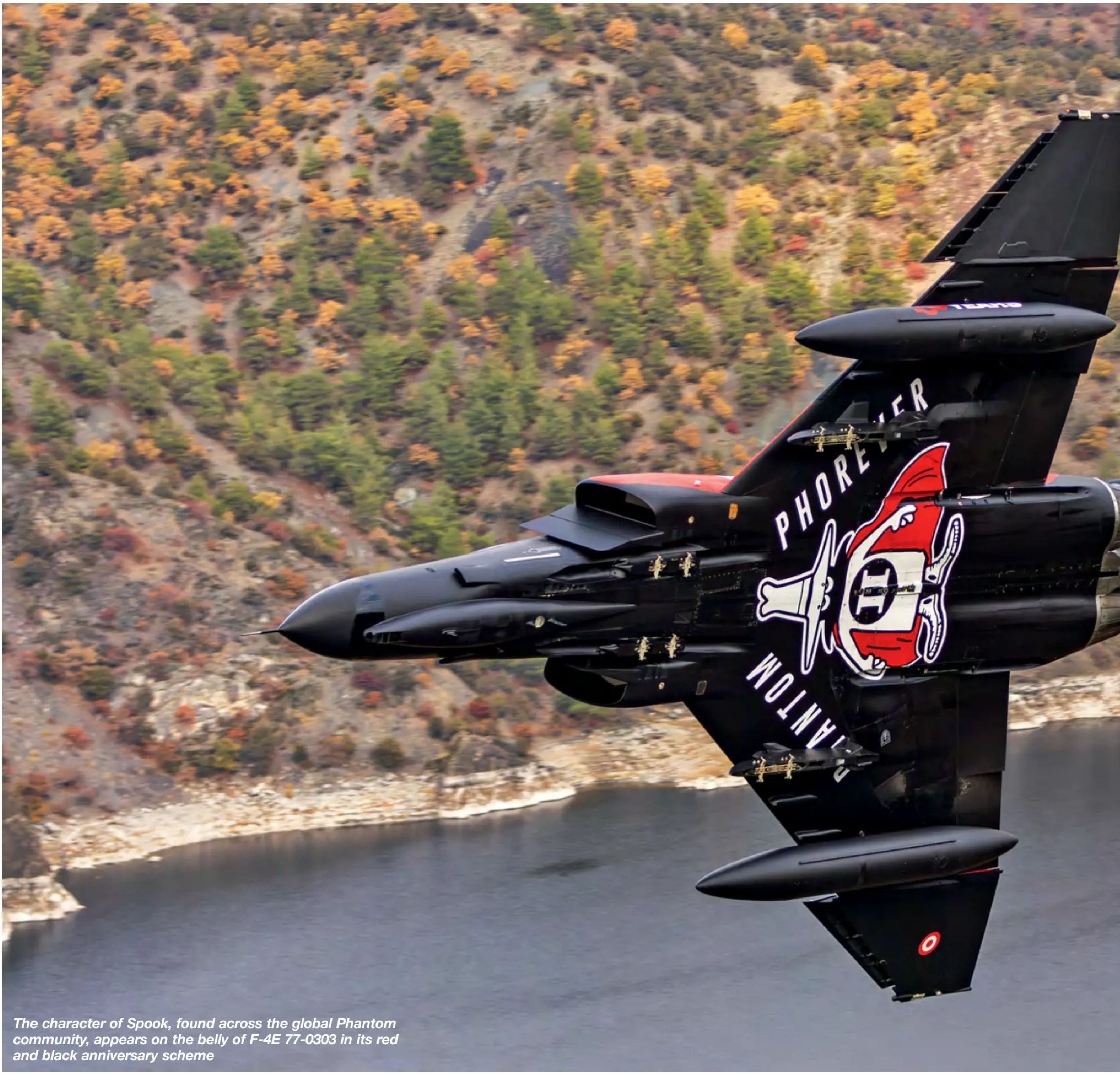
***The Phantom has been flying with the Turkish flag in the skies of Anatolia for 50 years All images** Cem Dogut*

By the 1960s, the striking power of the Türk Hava Kuvvetleri (Turkish Air Force – TurAF) was formed by the F-84 Thunderstreak and F-100 Super Saber aircraft, which were acquired through the US assistance program. In addition to these, the TurAF was also operating a small number of F-5 Freedom Fighter and F-104 Starfighter aircraft. Due to the problems that began in Cyprus in 1960 and the crisis that escalated with Greece after the intervention on the island in 1964, the need for a new multi-role fighter plane emerged in the early 1970s.

The acquisition of 36 F-4E Phantom IIs by Greece under the Peace Icarus project in 1971, highlighted the necessity of meeting the modern and powerful aircraft need of the TurAF. Contract negotiations with the USA started in February 1972 and were completed in a short time, and the Peace Diamond project was launched within the same year. A total of 40 F-4E Phantom II aircraft were ordered and the project was financed from the national budget.

With the arrival of two F-4E Phantom II (73-1016 and 73-1017) aircraft to the 1. Ana Jet Üs Komutanlığı (1. Main Jet Base Command) with US pilots on August 30, 1974, the Phantom page was officially opened in the history book of Turkish aviation, and the incoming Phantoms entered service with the 113 ‘Tayfun’ Filo (113th ‘Typhoon’ Squadron), established the same year at Eskişehir. F-4Es were taken to the Turkish skies for the first time by Tayfun Squadron Commander Major Ergin Celasin and Captain Ziya Alemdar with the Phantom 73-1016 on September 2, 1974. Squadron personnel became combat-ready in mid-1975. With the introduction of F-4E Phantom IIs, the Weapon Systems Officer (WSO) class, which did not exist in the Turkish Air Force, was introduced and ‘Şimşek’ (‘Lightning’) Air Wing, which was established under the Squadron in 1976, began the combat readiness training of the F-4E Phantom II WSOs. Eight F-4E Phantoms, delivered in 1974, were assigned to the 113 Filo. Of the 32 aircraft that were

1974
50
2024
PHANTOM PHOREVER



The character of Spook, found across the global Phantom community, appears on the belly of F-4E 77-0303 in its red and black anniversary scheme

delivered in 1975, 12 were assigned to the 113 Filo, and the remaining 20 were assigned to the 112 'Şeytan' Filo (112nd 'Devil' Squadron). As part of the Peace Diamond II project, 32 F-4E Phantom II and eight RF-4E Phantom II aircraft were ordered in total. An interesting feature of the Peace Diamond II project is that the 5,000th serial production F-4E was delivered to the Turkish Air Force with the tail number 77-0290 within the scope of this project. The 172 'Şahin' Filo (172nd 'Falcon' Squadron) and the 111 'Panter' Filo (111th 'Panther' Squadron) were modernised with the aircraft that had been purchased since April 1978 under the Peace Diamond II Project.

As part of the Peace Diamond III project, 15 F-4E Phantom II aircraft were supplied from the Aircraft Maintenance and Regeneration Centre (AMARC) in the USA from July 1981 to April 1984. These planes, which were purchased under the Peace Diamond III project, were assigned to the 173 'Şafak' Filo (173 'Dawn' Squadron) after being painted in Southeast Asia (SEA) camouflage.

Within the scope of the Peace Diamond IV project, 15 ex-USAF F-4E aircraft were purchased between 1984 and 1985 to replace the losses of the four Phantom squadrons. These planes were followed by 40 ex-USAF Aircraft F-4E Phantom II aircraft with Peace Diamond V project in 1987. These aircraft were first modernised in the 131 'Ejder' Filo (131 'Dragon' Squadron) and later in the 132 'Hançer' Filo (132 'Dagger' Squadron) at 3rd Main Jet Base Command in Konya.

In 1991, military aid was received from the USA and its allies as a result of the support given to Operation Desert Storm, launched by the US-led coalition to remove Iraq from Kuwait. In this context, as part of the Peace Diamond VI project, 40 ex-US Air National Guard Aircraft F-4E aircraft were received between 1991-1992.

Innovations for the Phantoms

Phantoms brought about radical changes in the TurAF as a new generation aircraft. A good command of English was required for the documents (Standard Operating Procedure – SOP, Flight Manual etc) used in training in both the USA and in Turkey. This was given great importance in the training. The most difficult thing for the pilots assigned to the F-4 was that the aircraft was operated by two crew. Pilots who had flown in a single-seater fighter aircraft for many years had difficulty adapting to the fact that there was someone else behind them in the rear cockpit. The F-4 had a specific division of labour where the pilot in front was

Phantoms fly over Lake Burdur. The surface of the lake appears golden in colour, appropriate for the aircraft's golden anniversary

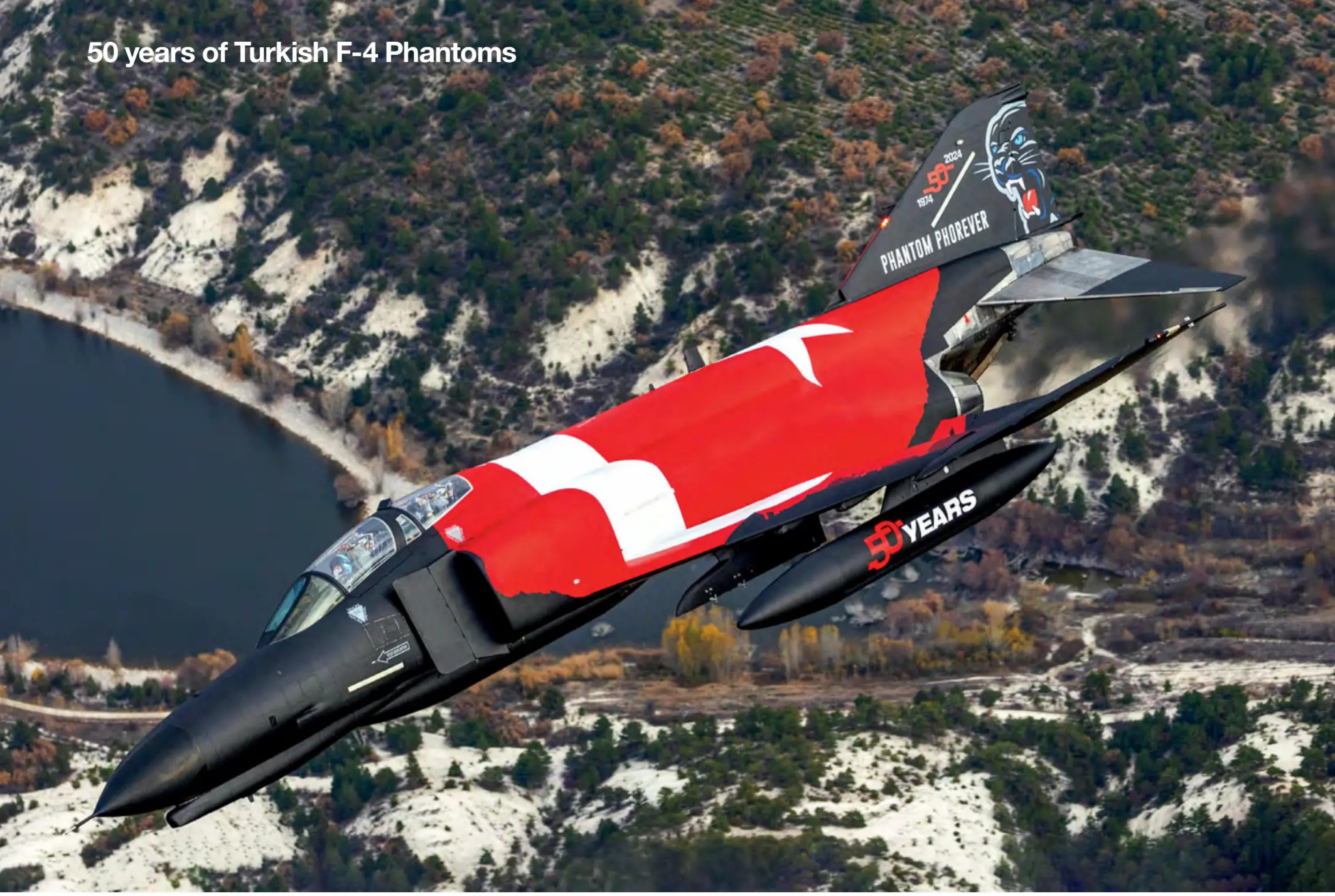
Phantoms in a three-ship formation – it was a challenge to maintain formation while flying at low speed for photographers on the ramp

Ten Phantoms, led by 77-0303 in its special livery, perform an elephant walk at Eskisehir on November 17

responsible for flying the aircraft and the WSO in the back was responsible for using the weapon systems.

With the delivery of F-4E Phantom II aircraft, modern munitions such as TV-guided AGM-65A/B Maverick air-to-ground missiles (AGM), AN/AVQ-23 Pave Spike laser targeting pods, laser-guided 500 and 2000lb GBU-10/12 Paveway I/II and electro-optical guided 2000lb GBU-8 HOBOS bombs were also added to the TurAF inventory. In this way, the Turkish Air Force gained the precision strike capability against air-ground targets for the first time in its history.

In addition to these modern munitions, medium-range semi-active radar homing AIM-7E Sparrow and short-range infrared heat-seeking AIM-9B/P Sidewinder missiles began to be used for air-to-air missions. Furthermore, one of the most effective



The Phantom's special markings are revealed in full as it moves away from the A400M by banking to the right

At the start of the Gulf crisis, Turkish Phantoms received air refueling training from American tankers. The first air refueling with an F-4E after the Turkish Air Force acquired the KC-135R aircraft took place on September 20, 1995

The huge red and white Turkish flag on black also resembles the air force roundel

Golden anniversary

There is a special bond between aviation enthusiasts and the Phantom in Turkey, as well as all over the world. It is a concept that connects people. This bond is so strong in Turkey that the Phantom's nickname is Baba, meaning Father. Those who served and flew with the Phantom trusted it – they had faith that the Phantom would never let them down and would bring crews home safely.

Few aircraft have served in an air force for 50 years. The TurAF celebrated the living legend's big anniversary with a series of events. These events also include firsts for Türkiye. The first of these events was an air-to-air photography session on November 15. What makes this shoot different is that for the first time, civilian photographers had the chance to photograph the Phantom from the open ramp of a cargo aircraft.

The session began with a briefing held at the 111 Filo Komutanlığı. Phantom pilots, photographers and the A400M team came together to plan the flight and shoot. The bad weather was the most challenging element, making it necessary to stay below 10,000ft in order for the cargo ramp to be open. However, it was possible to go below the cloud in and around Lake Beyşehir, which is 160 miles from Eskişehir.

Another difficulty was that the ramp-open speed limit of the A400M and the minimum steady flight speed of the F-4E Phantom were very close to each other. It was challenging to adjust the positions of both the A400M and the Phantoms without getting into each other's jet wash. This also limited manoeuvres. Another disadvantage of jet wash is that it distorts the clarity of a photo. To avoid this, the Phantoms mostly flew at lower altitudes than the A400M. The photo shoot was carried out at a speed of between 180 and 200kts at altitudes of 8,000 to 10,000ft.

Another first, on November 16, was that low-level flight training was followed by photographers for the first time. There is no fixed low-level flight training area in Türkiye. Pilots use different valleys for this purpose, depending on the type of mission and aircraft type. These valleys are generally in the Aegean and Eastern Anatolia. Eskişehir is a city built on a plain; it is difficult to find a valley nearby. Personnel from 111 Filo scanned the area to find a suitable area for photographers and found a dam on a water reservoir. The width and depth of the valley were ideal for both flying and photography.

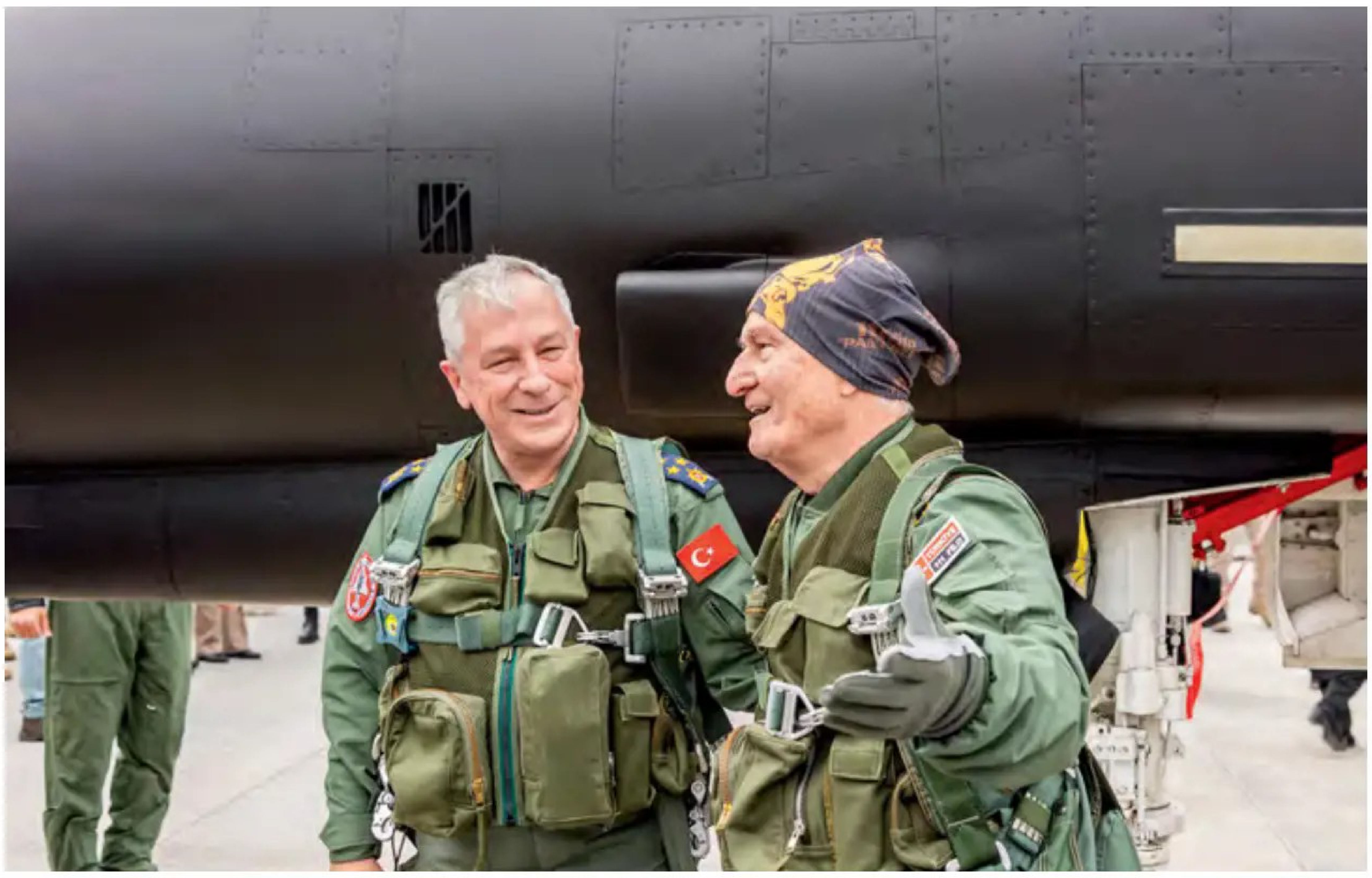
Unfortunately, the weather was cloudy on the day of the shoot; the weather reports received before the flight predicted that the clouds would become suitable for flying in the afternoon. A pilot from the squadron was in the area as an observer and gave the necessary approval for the flight to begin at 1430hrs. With the first pass at 1513hrs, an unforgettable experience began for aviation enthusiasts. Two Phantoms made more than 20 passes in just over half an hour and incredible shots were captured by the estimated 350 local and foreign photographers that had gathered in the region.

The next day, on November 17, a 50th anniversary ceremony was held at the 1. Ana Jet Üssü, Eskişehir with the Turkish Air Force Commander in attendance. More than 650 spotters and over 30 journalists, as well as active and retired personnel, attended the event. The ceremony began with the flights of four phantoms, in which the air force commander participated.

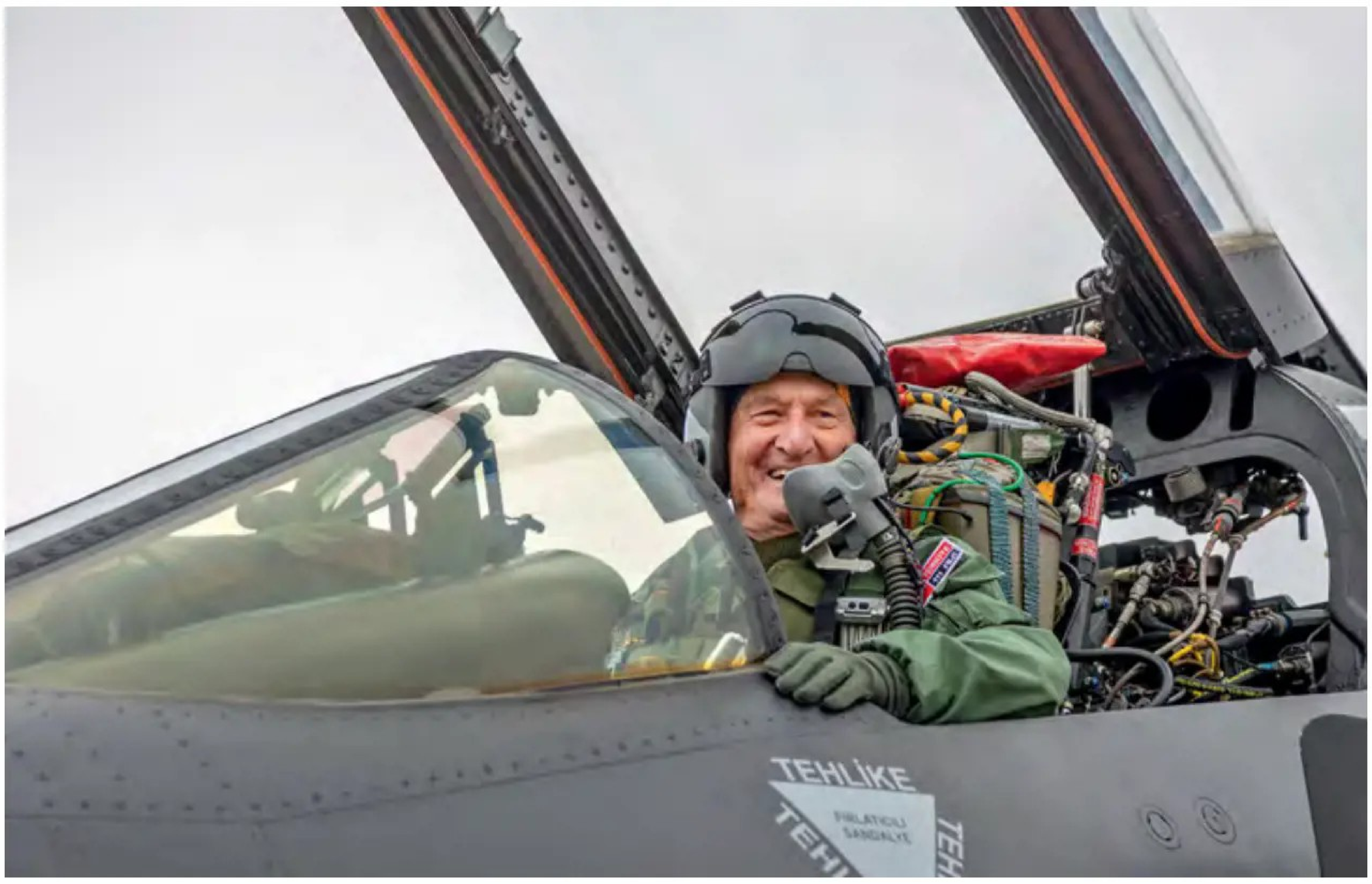
After taking off, the Phantoms flew in various formations for half an hour and saluted the spotters upon landing. Air Force Commander Ziya Cemal Kadıoğlu, flying in a specially painted aircraft for this ceremony, arrived at the parking area. Here, he was greeted by the first Turkish Phantom pilot and first Squadron commander, former Air Force Commander, Ergin Celasin.

The ceremony continued in the afternoon with a flight of four Phantoms. After performing various manoeuvres, six more Phantoms were added to those aircraft on the ground. The crowd was saluted by ten planes performing an elephant walk.

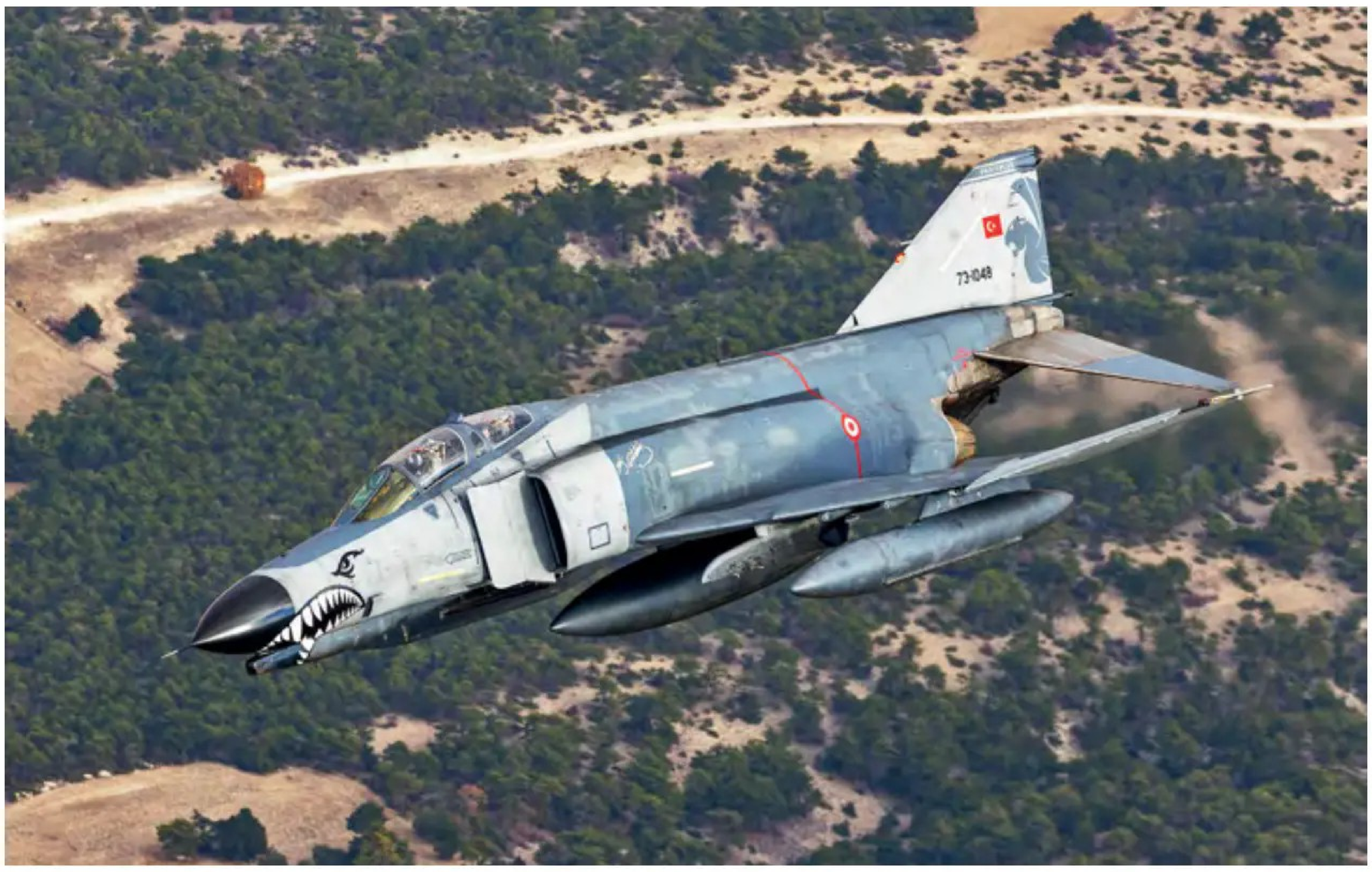
The Phantom took its place in Turkish skies with the first squadron established in Eskişehir 50 years ago, and now the only remaining fleet continues its duty with the 111. Filo. The Phantom, which has started a new era in Turkish aviation and will continue to contribute to the country's defence for a while longer.



Current Air Force Commander Ziya Cemal Kadıoğlu greets former Air Forces Commander Ergin Celasin, the first Turkish Phantom pilot



Eighty-six year-old Ergin Celasin was the first commander of 113th Squadron, the first Phantom squadron. The first Phantom that underwent Terminator modernisation was delivered to the 111th Squadron and Celasin made the first flight as the Air Force Commander



Eye to eye with a Phantom from the cargo ramp of an A400M

Above: ***While the Phantom pilot shows off his flying skills in the valley, the AKU shows off panther claws. AKU (Arka Kokpit Uçucusu – Rear Cockpit Officer) is the equivalent of Weapon Systems Officer (WSO) in the Turkish Air Force***

Left: ***The Phantom is a unique aircraft whose design consists of angles. The upward slope of the wing and the downward slope of the elevator are easy to see in this photo***

electronic countermeasures (ECM) system, ALQ-119 pods were introduced to increase the electronic warfare capability and protect the aircraft against radar-guided surface-to-air missiles (SAM). Thanks to the APQ-120 radar, which is considered to be the most advanced technology system of its time, the F4E Phantom II can carry out interceptions day and night, in all weather conditions. Thus, the 112th and 172nd squadrons were assigned as an all-weather fighter-interceptor squadron with Sparrow and Sidewinder missiles. Twelve aircraft had TISEO (Target Identification System Electro-Optical), which could fire TV-guided electro-optical missiles 20 to 24 miles from the target.

The TurAF's first encounter with air refuelling was in the Gulf Crisis. With the increasing tension in the region, the number of American tanker aircraft arriving at Incirlik increased rapidly. During this period, the first training of the Phantoms with American tankers began, and the squadrons began to gain air refuelling experience.

Keeping up with the times

Making its maiden flight in 1958, the Phantom represent the technology of the 1960s. Thanks to their standard APQ-120 radar system, the Phantoms successfully carried out air-to-air missions until the mid-80s. However, by the 90s, the existing F-4E Phantom II aircraft in the Turkish Air Force inventory reached high numbers in terms of both airframe life and flight hour rates. Eventually, they became outdated and could not respond to current needs and threats. Turkey had two alternatives

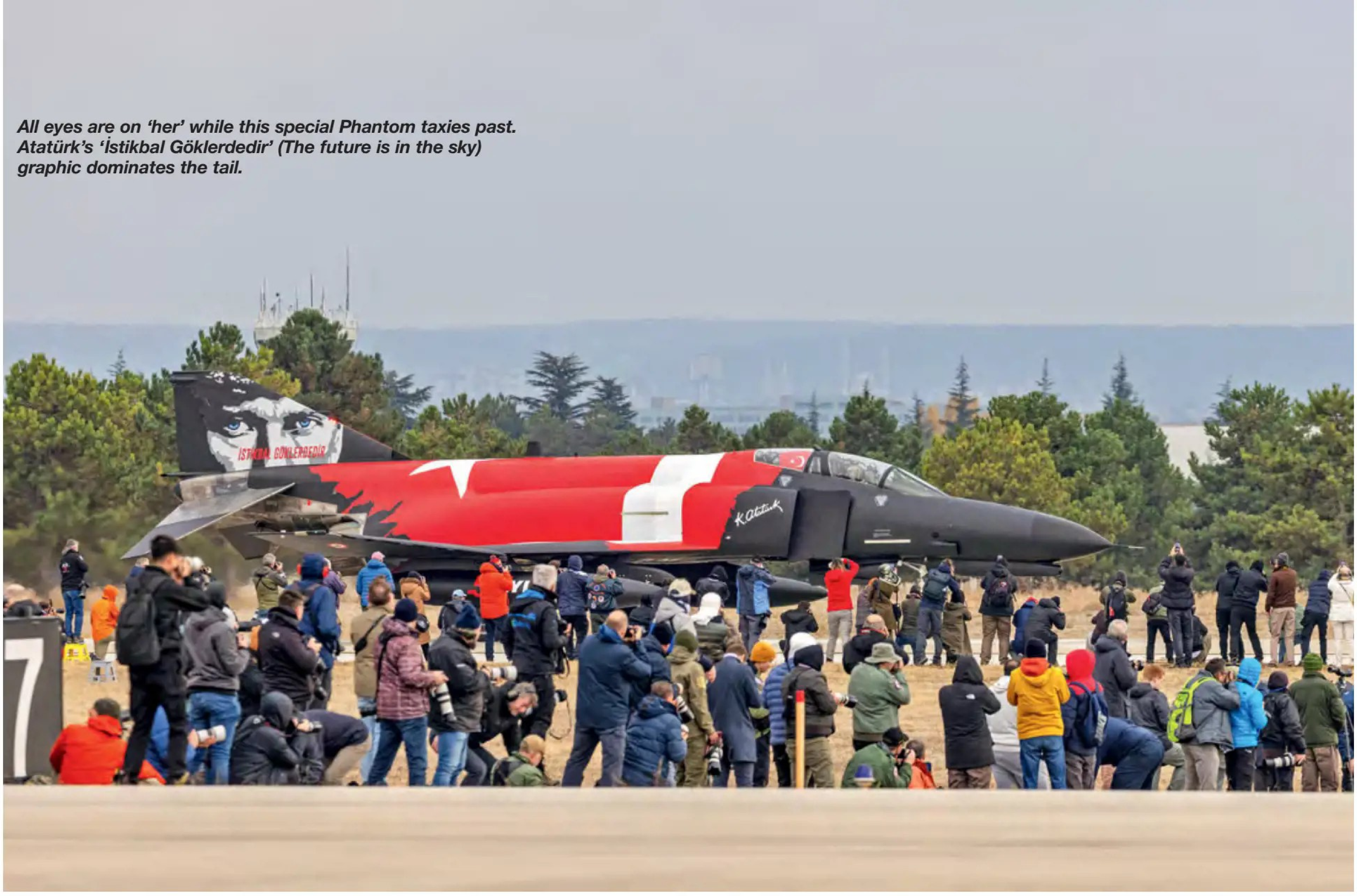
Above: ***The Phantom has played an important role in counter-terrorism operations. It is armed with prefragment Mk-82 ammunition which explodes in the air, creating fragmentation across a wide area. This aircraft was seen at Erhac on May 25, 2017***

Right: ***73-1026, which was delivered in 1974, was modernised in 2000 and started a new life with the name F-4E/2020 Terminator***

to maintain its strong military position in the region and to increase its deterrence. In line with this need, Turkey would either replace the old Phantom aircraft with a new twin-engine fighter-bomber or upgrade some of the existing F-4E Phantom II aircraft with a comprehensive modernisation project to increase their service life for at least 20 more years. Turkey favoured the modernisation option for economic reasons. Turkey's 30 years of experience in training, equipment, materials, repair, maintenance, and logistic support capability also played a significant role in this decision.

The Israeli Aerospace Industries (IAI) solution, based on the Kurnass 2000 developed for the Israeli Air Force, included the replacement of the existing radar with ELTA product EL/M-2032 and the integration of AN/ALQ-178[V]3 electronic countermeasure system, MXF-484 VHF/UHF radio, HOTAS flight control system, heads-up display (HUD), integrated INS/GPS navigation system, airborne videotape recorder (AVTR), full-colour multi-function displays (MFD), a new mission computer and MIL-STD-1553B data bus. Furthermore, the aircraft would gain the ability to fire Popeye-I air-to-surface guided missiles (ASM) and carry ELTA EL/L-8225 electronic warfare pods.

According to the agreement, 26 of the 54 F-4E Phantom aircraft were to be modernised in Israel, and the remaining 28 were to be upgraded in the 1st Air Supply and Maintenance Centre of the Turkish Air


All eyes are on 'her' while this special Phantom taxies past. Atatürk's 'İstikbal Göklerdedir' (The future is in the sky) graphic dominates the tail.

İSTİKBAL GÖKLERDEDİR
K. Atatürk
7

Above: ***After the Panther and Devil Squadrons merged, the devil's shark mouth became a standard for the Panthers. The Phantom's nose structure is ideal for it***

Right: ***High speed and sharp manouvres combined with the humidity to create an incredible image***

Force located in Eskişehir. Israel was to provide the necessary structural and avionic modernisation kits for the 28 jets to be upgraded in Turkey, train Turkish engineers for avionic integration, establish a System Integration Laboratory (SIL), and transfer this laboratory to Eskişehir. Thanks to this technology transfer provided by Israel within the scope of the project, the 1st Air Supply and Maintenance Centre was planned to acquire the capability to carry out the desired structural and avionic changes on the aircraft by improving the technological infrastructure of the centre.

The most significant improvement that increases the strike capability of the Terminators is that the F-4E/2020 aircraft can fire Popeye missiles. The Popeye is a solid rocket-powered stand-off missile weighing 1,360kg (3,000lb) with a 340kg (750lb) blast fragmentation or 360kg (800lb) I-800 penetrating warhead and imaging infrared or TV guidance. It has a reported range of 100km, depending on its launch altitude. The missile can also be controlled directly through the data link.

The first two F-4E/2020 (73-1032 and 68-0498) were delivered to the Turkish Air Force with a ceremony held on January 27, 2000.

During its 50-year long adventure in Turkey, which started on August 30, 1974, Phantoms served in nine different squadrons (111,112,113, 131,132,171,172,173, and 401) and introduced the Turkish Air Force to modern radar, ECM and ammunition. In addition to working with advanced weapon systems, Phantoms had another significant contribution; thanks to the Terminator modernisation projects, the TurAF and Turkish Defence Industry gained unprecedented experience in system integration, product development, and testing procedures. **afm**

The leading edge slats that are unique to late F-4Es allow the Phantom to fly at low speeds and make sharper turns

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Training for the future

The Argentine Army Aviation School is where all military helicopter pilots are trained, but it also prepares personnel for other functions. Santiago Rivas finds out how it works

The Argentine Army Aviation School trains all military helicopter pilots of the Argentine armed forces

The Argentine Army Aviation School has a broad and important mission in training the force's personnel who are linked to all things aeronautical. Although its main function is to carry out the Curso Básico Conjunto de Piloto de Helicópteros (CBCPHEL; Joint Basic Helicopter Pilot Course), it is also responsible for training commercial pilots who are assimilated into the force, mechanics and ground support personnel, among others. It is currently one of the main air units of the force, but it does not depend on the Army Aviation Directorate, but is part of the Operational Education Directorate, which reports to the Deputy Chief of Staff.

A long history

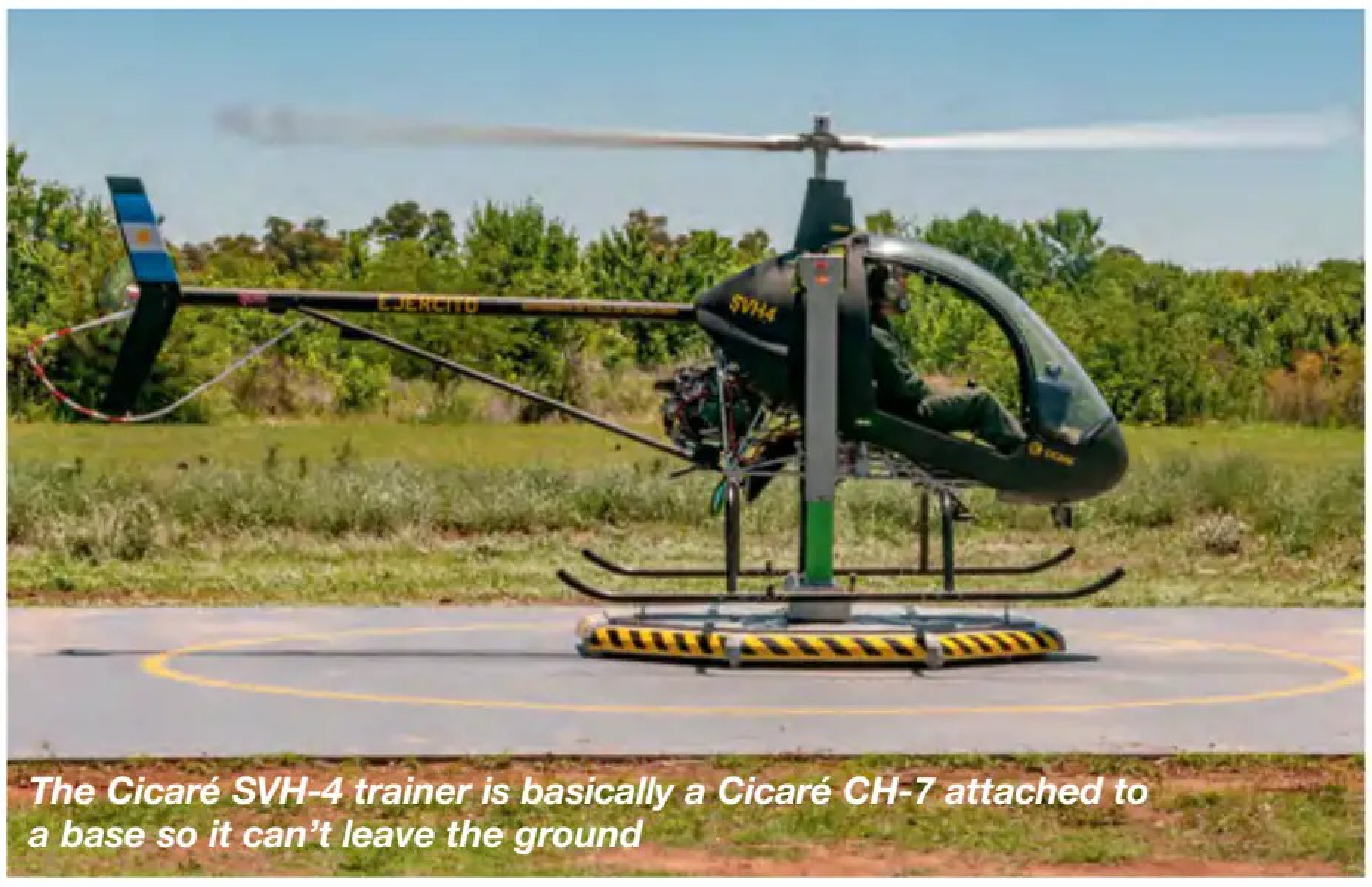
The Argentine Army was the cradle of military aviation in Argentina, when the Military Aviation School was founded on August 10, 1912. When the army aviation reached an important degree of maturity in January 1945 it became independent as the Argentine Air Force (AAF). Since then the army had always maintained the idea of resurrecting its aviation wing, which slowly materialised during the 1950s and 1960s. However, the army lacked an institution that would allow it to train its own personnel, which was generally carried out by the AAF and Naval Aviation Command, although some pilots were also trained in the units.

With the induction of the Bell UH-1H into service, pilots and mechanics were sent to train in the US. Then, in October 1973, the División de Instrucción de Vuelo (Flight Instruction Division) was created using Fairchild Hiller FH-1100 helicopters received in 1968 and Piper L-21B aircraft acquired in 1957. It received five Cessna T-41D Mescaleros on May 12, 1976.

By 1987, the division had been renamed the Departamento Escuela (School Department) and, on November 23, 1989, the Escuela de Aviación de Ejército (Army Aviation School) was officially created.

Since its inception, the training school has always operated from Campo de Mayo

All students receive at least 80 flight hours of training before graduating

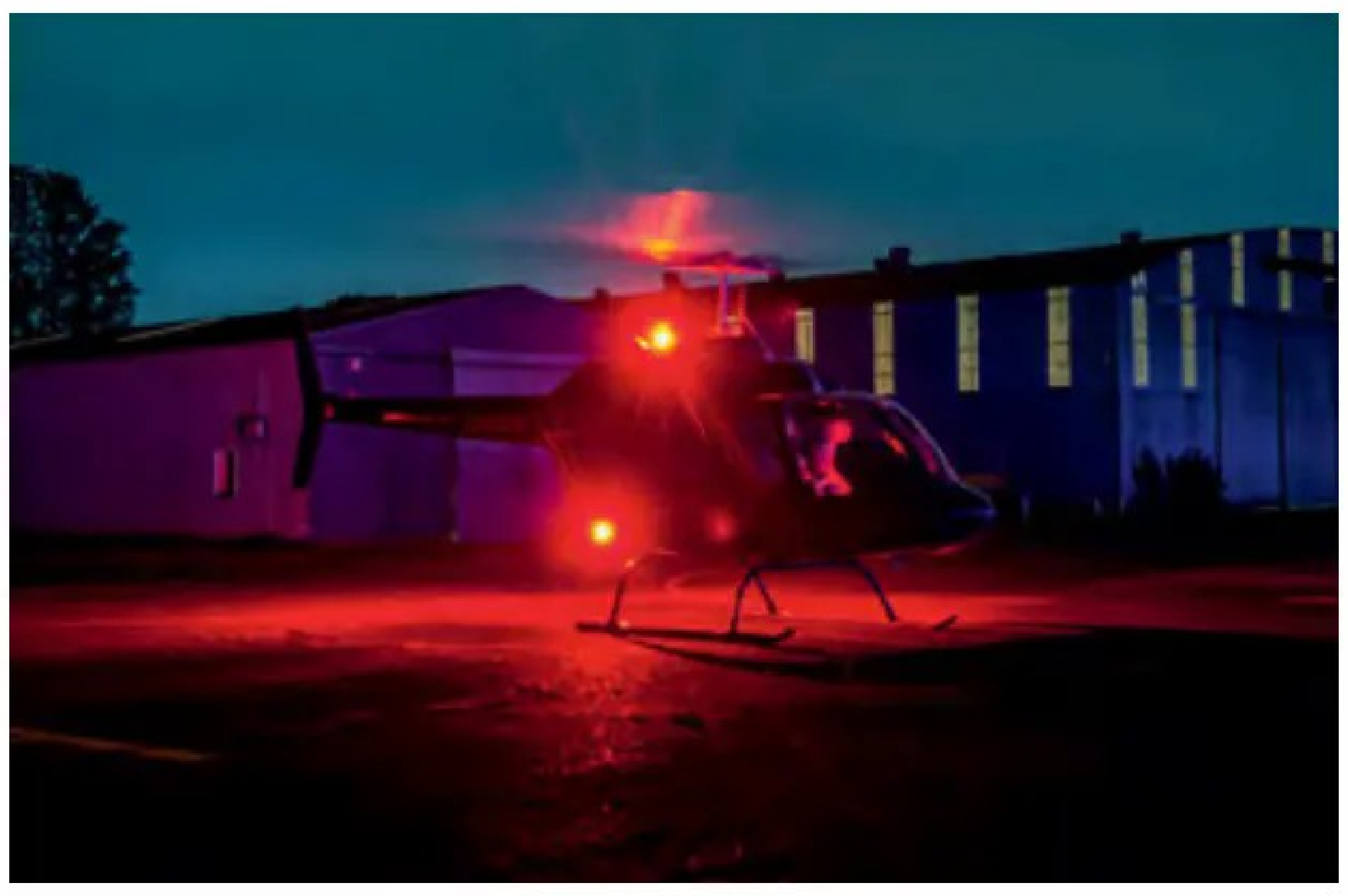


The Cicaré SVH-4 trainer is basically a Cicaré CH-7 attached to a base so it can't leave the ground

Military Aerodrome near Buenos Aires, with its facilities at the northern end of the airfield. In addition to training officers who have graduated as pilots from the Military College of the Nation, the school is also in charge of receiving technical pilots, civilian commercial pilots who oined the force and need to improve as military pilots.

To add capabilities, in 1992, the school incorporated two Cicaré SVH-3 trainers, basically a Cicaré CH-5 helicopter attached to a base that does not allow it to gain altitude. These were replaced by a more modern SVH-4, based on the CH-7 helicopter, although it is currently out of

Since 2011, the Bell 206B-3 has been the main training helicopter of the school, supported by three AB-206B-1s



The second stage of the training includes a night flight, first on VFR, then on IFR and finally using NVG

Students performing formation flight training to the northwest of Buenos Aires

The school also trains pilots who are moving from the civil sector to the military

use because it had been noticed that the trainer generated certain bad habits in the students over time, which need to be broken before they went on to fly the real helicopters.

After the experience of training pilots with the navy and as part of an increase in interoperability, in 2007 the Curso Básico Conjunto de Aviador Militar (CBCAM; Joint Basic Course of Military Aviator) was created at the Military Aviation School of the Air Force, where all fixed-wing pilots are trained, which led to the implementation in 2009 of the Curso Conjunto de Piloto de Helicóptero (CCPHEL; Joint Helicopter Pilot Course) at the Army Aviation School to train the rotary wing pilots of the three forces.

Initially, this course only provided advanced training for six months starting in August, using Bell UH-1H helicopters.

The addition of five Bell 206B-3 Jet Rangers in 2011, saw the Hillers UH-12ETs retired. The UH-1Hs were then used by army pilots for basic training along with aircrews from other air forces.

However, this changed in 2019 when pilots from all three services was unified into one training course, the Curso Básico Conjunto de Piloto de Helicópteros (CBCPHEL; Joint Basic Helicopter Pilot Course), flying both Bell 206B-3s and three of the 11 Agusta Bell AB-206B1s received from 2017. In addition, they maintain two operational Cessna T-41s.

Present

In addition to the CBCPHEL, the Army Aviation School offers ten other courses. Among them is the Complementary Training for Aviation Mechanics, which is an annual course. Other courses are the Aviation Safety Course, which is given to the security officers of the different units, the Subunit Commander Course undertaken by all the lieutenants of Army Aviation and the Basic Command and Staff Course. The last two work with the school's tactical simulators, where they learn all the basic and complementary operations, such as air assault, attack, scout and security.

With the simulator, which was built by the unit, they can execute missions in real-time, day and night, so that they experience operating under fatigue.

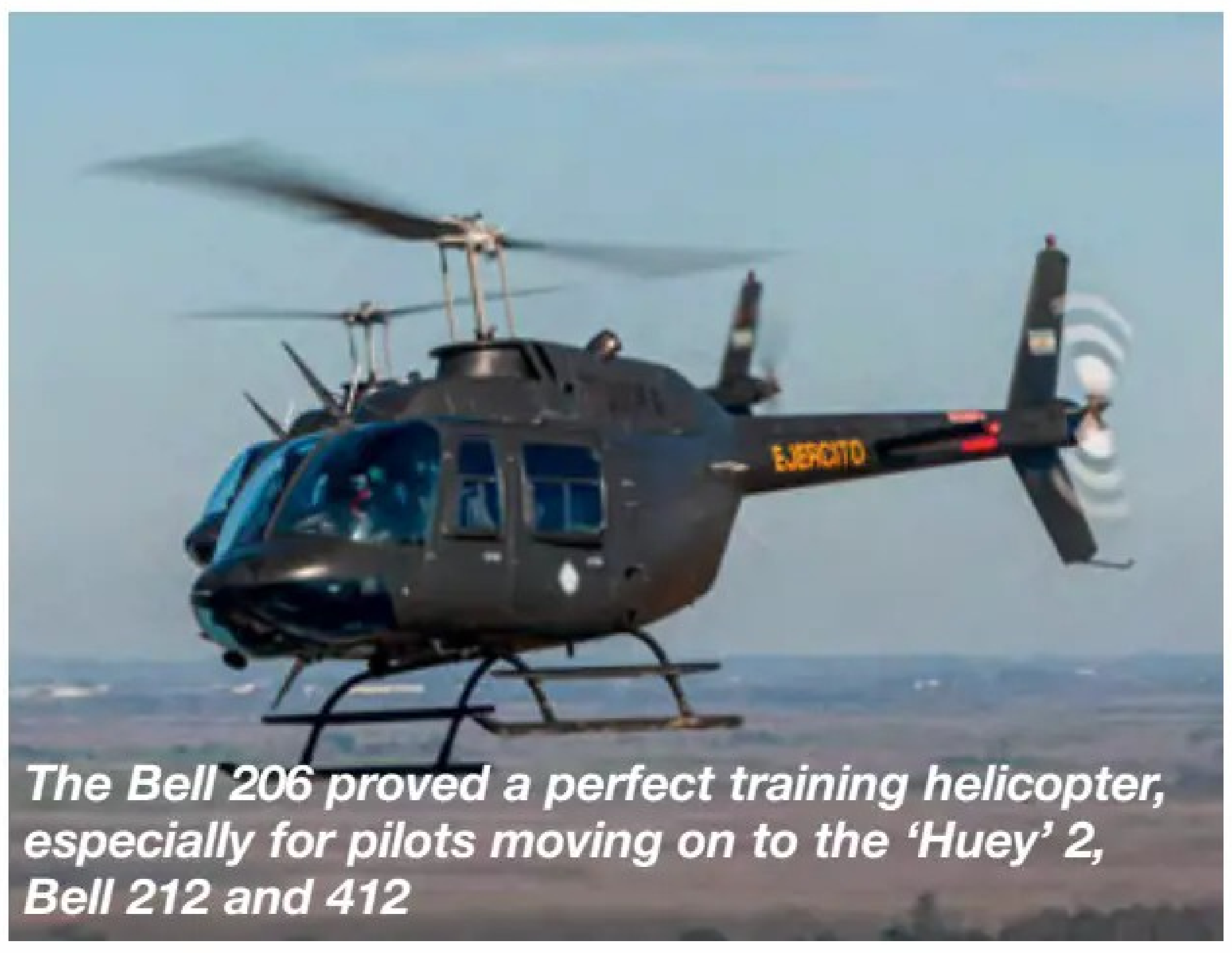
The Army Aviation School also offers the Instrument Flight Course, the Aeronautical Technical English course and the Flight Support programme for infantry, cavalry and artillery non-commissioned officers of army units, to give them the basic knowledge of operational helipads. Some courses, given every two years, cover training of Flight Instructors and the Maintenance Test Pilot.

The Army Pilots Course is the second method of recruiting aircrews, by taking on commercial pilots who pass a short exam at the Military College. They then go through basic militry training and then military flight training in fixed- and rotary-wing arcraft.

Army pilots who are trained on fixed-wing only fly the Cessna T-41, while those destined for helicopters take a 25-hour adptation course, which is similar to the one done by CBCPHEL, but more summarised.

A mixed fleet of Bell 206B-3s and Agusta Bell AB-206B-1s on the tarmac of the school

The first stage of training takes place at Campo de Mayo, after which students move to the northwest of Buenos Aires


The Bell 206 proved a perfect training helicopter, especially for pilots moving on to the 'Huey' 2, Bell 212 and 412

Pupils learn to fly on instruments using the Agusta Bell AB-206B-1

Army pilots take their first flight lessons on the helicopters of the school

Joint Basic Course

The Joint Basic Course is where all helicopter pilots of the Argentine Armed Forces are trained. The Navy and Air Force students arrive after completing the Joint Basic Military Aviator Course at the Military Aviation School, with about 120 hours of fixed-wing flight experience. The Army's influx of students every July are made up of second lieutenants or lieutenants.

The school is also in charge of selecting those who will fly fixed wing aircraft, who leave for the Military Aviation School to take the Joint Basic Military Aviator Course and then go directly to their fixed-wing units.

Pupils arrive in the first week of February and learn the theoretical side of flight.

The flying aspect of the course begins on the Cicaré trainer, then candidates move on to the Bell Huey 2 Frasca simulator and Bell 206 simulator, where they are given five hours of training and begin to understand to co-ordinate the commands of the aircraft. Once they pass that stage, they enter the first stage of flight, which is 40 hours learning to fly the helicopter. After approximately 18 hours, they have the first inspection, where their flight manoeuvres are evaluated and any unsuitable candidates are excluded. If a pilot passes the inspection, the emergencies stage begins with a view to progressing to their first solo flight following a further evaluation. At that point, they begin learning to operate the aircraft, fly in formation, work in confined areas, train on basic instruments and radio, perform tactical flights and undertake a night flights. In total, they fly about 80 hours.

In 2019, instruction began to include night-vision goggles, with theoretical training and practical flying for five hours, covering everything from landing in confined areas. Some classes are held by war veterans, so that students can learn from their experiences This training is to help enable students to fly with operational units, which is completed once they reach their destination unit. The next stage is visual navigation, followed by radio navigation and the year closes with a secondment to the city of Bahía Blanca, where they operate with the support of the Naval Aviation at Comandante Espora Naval Air Base and carry out cabin exit training in the water.

Finally, students take their final exam, graduating in the first week of December.

Army pilots go to operational units to fly the Bell UH-1H, 'Huey' 2 or AB-206 helicopters, while members of the navy and air force return totheir units. **afm**

Tackling Europe's infernos

With wildfires on the increase across Europe, **Igor Bozinovski** profiles the American aircraft that has become the workhorse of aerial firefighting efforts

The Air Tractor AT-802 is an innovative and modern agricultural, firefighting and military/ground-attack aircraft designed and manufactured by the US aircraft manufacturer Air Tractor Inc. (ATi). The plane took-off for the first time in October 1990 and in its most prominent fire-fighting role is considered a Type III Single Engine Air Tanker (SEAT) that can carry 3,104 litres of water in a hopper located between the engine firewall and the cockpit.

For precise fire-fighting operations the plane is equipped with the Fire Retardant Dispersal System (FRDS) that in its latest Generation III version is an aircraft underbelly all-electric firegate. An advanced computer in the cockpit gives the pilot the ability to choose how to use the water/foam/retardant it carries: from making multiple drops with a single water reservoir, through to the creation of 600-800m-long, 10m-wide uninterrupted retardant barrier lines intended to stop the wildfire spreading, to a massive 3,104-litres water bomb that can be released in 1.4 seconds.

Terrestrial AT-802 and amphibian Fire Boss

The AT-802 is available as a single-seat (AT-802A) or twin-seat (AT-802) aircraft, and in land and amphibious configurations. Equipped with conventional landing gear (two main wheels and a tail wheel), the AT-802 operates from airport runways as well as from short dirt strips and/or public roads. In this variant, the plane is filled with water on the ground from firefighting or water-carrying trucks, from a water tank or simply from the hydrant installation available at the spot. Using a high-flow pump, it takes less than two minutes to fill the plane with 3,104 litres of water.

The Fire Boss is the result of equipping an Air Tractor AT-802 or AT-802A with Wipline 10000 scooping floats and a range of additional modifications. Each float features hydraulically extendable/retractable landing gear with single-wheel nose leg and twin-wheel main leg). This specialised firebomber can land on traditional paved or unpaved runways and can be filled with water on the ground or can scoop/collect water by skimming the surface of rivers, lakes, water accumulations, dams and open seas. It needs less than 1,000m and 15 seconds to scoop 3,104 litres of water.

With its long endurance of more than four hours, the AT-802 can also be used as a Search and Rescue or Aerial Surveillance platform, and this is especially true for the twin-seat AT-802 that can accommodate a back-seat observer and a camera system with live video transmission to ground based operational centre. The two-seater is also often used as a command post for aerial firefighting co-ordination while at the same time being utilised for training new and proficiency checks of existing AT-802 pilots.

Two-seat armoured military AT-802s also exist and these are designated AT-802U and AT-802L Longsword (USAF: OA-1K). The military grade versions are modified with sensors and reinforced for weapons carriage and tailored for intelligence, surveillance, and reconnaissance (ISR) and light attack roles.

The current production AT-802s are powered by a very efficient 1,700 HP PT6A-67F engine that drives a metal five-blade Hartzell propeller. This engine's low average fuel consumption of 300 litres/hour combined with the aircraft fuel capacity of 1,438 litres (accommodated in two integral fuel tanks) allows operational endurance of more than four hours at temperatures of up to 49°C. The Direct Operating Cost of a fire-fighting AT-802 is in the range of $900 per flight hour.

Globally recognised and utilised fire-fighting tool

With the Bombardier CL-415 Canadair (6,137 litres) out of production since 2015 and its announced successor – the De Havilland DHC-515 Firefighter – yet to be launched, the AT-802 remains the only purpose-built firefighting aircraft currently in production in Europe and North America. Its production continues at a rate of some 25 aircraft annually, with the 2025 price of new single-seat Fire Boss being in the range of $5.2m with new single-seat AT-802 with conventional landing gear costing around $3.7m. These prices are dependent on the final configuration of the aircraft, cost of delivery to its buyer and various variable factors present in the procurement agreement.

North Macedonia's three Air Tractor AT-802A Fire Boss single-seat amphibian planes have been in active service since June 2010. An upgrade is now due with the new Trotter Controls Fire Retardant Dispersal System (FRDS) Gen III systems and new more powerful PT6A-67F engines.

North Macedonia

Operator	Unit	Base(s)	Quantity	Variant
Protection and Rescue Directorate	Flight for Specialized Aircraft Services	Skopje/ Petrovec	3	AT-802A Fire Boss

Over 1,150 AT-802s have so far been produced in Olney, Texas, and the aircraft is now a fire-fighting standard for most wildfire-prone countries. With almost 130 fire-fighting AT-802s currently operating in the Mediterranean and with 37 new such planes yet to be produced and delivered to Turkey (12 out of which four by April 2025) and Greece (25 planned, still in a tender process phase of the acquisition) over coming years, Europe will continue to have the biggest concentration of fire-fighting Air Tractors.

What follows is an overview of the European military and civil protection AT-802 in alphabetical order:

Croatia

Croatia is one of the oldest European AT-802 operators with the following planes being noted serving Croatian Air Force (Hrvatsko ratno zrakoplovstvo, HRZ): twin-seaters with factory c/n 802-0090 (HRZ serial 890), 802-0091 (891, written-off in non-fatal accident on September 2, 2004) and 802-0456 (897); and single-seaters 802A-0254 (892), 802A-0256 (893), 802A-0258 (894, written-off in non-fatal accident on June 25, 2011), 802A-0290 (895) and 802A-0296 (896).

Currently, HRZ has six planes (twin-seat land-based AT-802: 890; twin-seat amphibian AT-802 Fire Boss: 897; and four single-seat amphibian AT-802A Fire Bosses: 892, 893, 895 and 896) that are operational with the 855 33Protupožarna Eskadrila (855th Fire Fighting Squadron) stationed at the 93rd Zemunik Air Force Base, near Zadar.

The training of AT-802 pilots and aircraft line maintenance is organized by HRZ while heavy maintenance is carried out by Velika Gorica-based Zrakoplovno Tehnički Centar (Aeronautical Technical Centre).

Investments in modernising the existing aircraft are also expected, with focus on installing new FRDS Gen III systems and replacing the existing with new and more powerful PT6 engines. Acquisition of new AT-802s is also under consideration.

Cyprus

One of the first European countries to join the AT-802 fire-fighting club, Cyprus took delivery of a land-based twin-seat AT-802 (registered FD-1, c/n 802-0335) at the Cypriot Department of Forests in October 2009. The aircraft now operates from Larnaca airport.

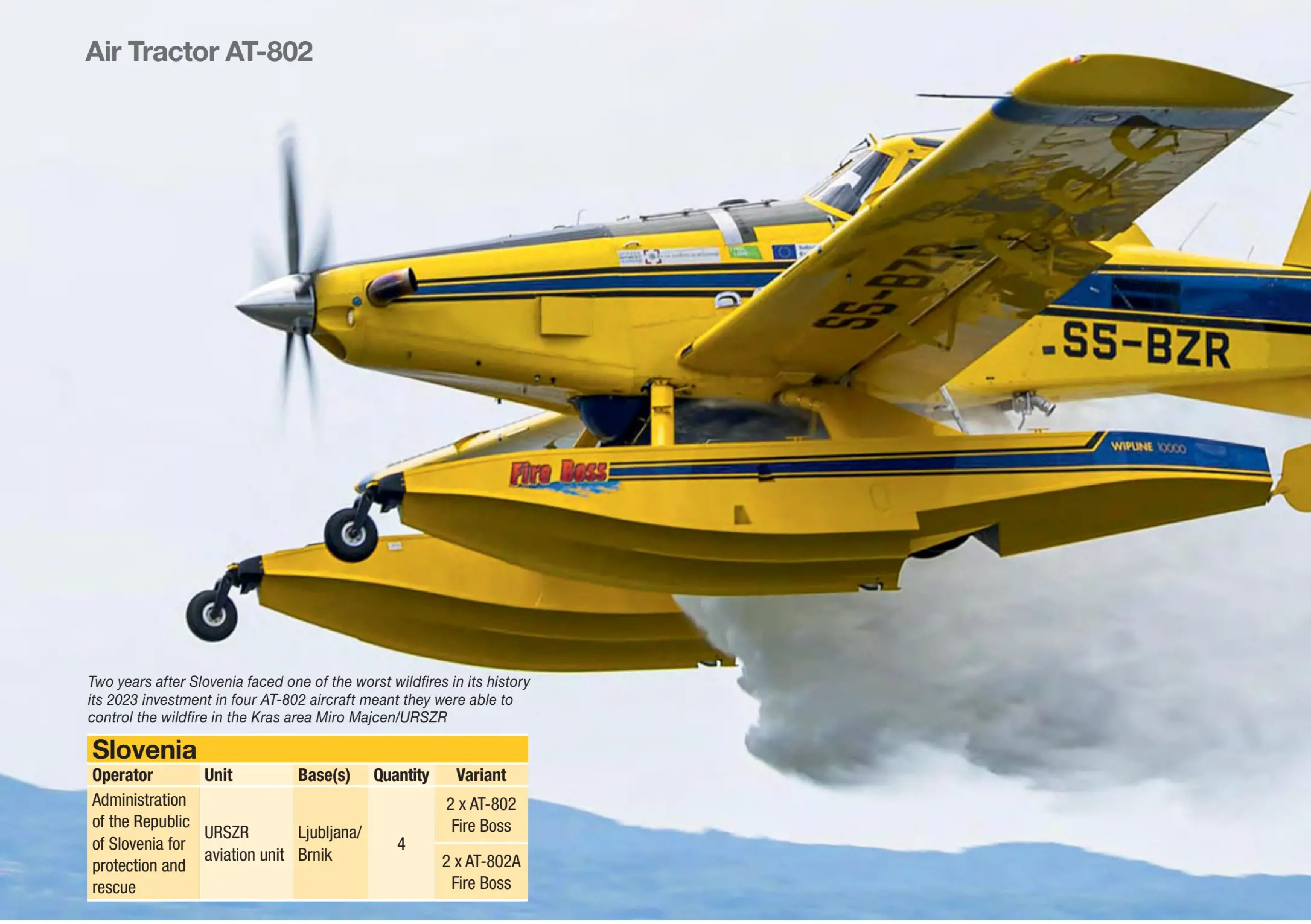
In 2020, Cyprus began leasing a pair of twin-seat land-based AT-802s from the Spanish, Viver-based company Titan under a multi-year agreement, 75% funded by the European Civil Protection Mechanism (rescEU). This arrangement, that further expanded in 2022-2023, saw Titan arranged the 2022-2021 deployment to RAF Akrotiri of two Spanish AT-802s, followed in 2022 by deployment of one Argentinian and one Chilean-registered aircraft to Pafos Airport. In 2023, the Spanish planes moved to Paphos and the South American aircraft rebased to RAF Akrotiri In 2024, the Spanish planes were replaced by Australian aircraft and the Chilean aircraft was replaced by a Uruguayan airframe. Being satisfied with the lease agreements and services received, the Cypriot Department of Forests has secured budget for acquisition of three AT-802s in an effort that should see Cyprus soon having soon its own fleet of four land-based AT-802 planes. Meanwhile, the sole Cypriot AT-802 will continue flying alongside four other commercially leased Air Tractors.

Israel

The deadly Mount Carmel Forest Fire in December 2010 exposed the serious flaws in Israel's Fire and Rescue Services. Four months later, the first three land-based AT-802 firefighting planes landed at Sde Dov Hoz airport, near Tel Aviv. Four additional planes of the same type followed, two being floats-equipped Fire Bosses. These seven aircraft were used to establish a new aerial firefighting unit named Elad Riven in memory of a teenage Fire Scout volunteer who was killed in the Carmel Fire. Elbit Systems Ltd and its aerial operation company Chim-Nir Flight Services purchased the planes that initially operated with the Israel Defense Forces/Air Force (IDF/AF) under a long-term private finance initiative.

In March 2012 one of the Fire Bosses was damaged in a take-off incident11 following which, a decision was made for the aircraft to be repaired and the entire AT-802 fleet to proceed operating in a land-based configuration. The Fire Boss floats were returned to Air Tractor Europe in Spain and used to partially pay for one more land-based aircraft that once delivered, brought the number of planes in Israeli service to eight. An additional six land-based AT-802s were acquired by Elbit in 2015, bringing the fleet to the current status of 14 operational aircraft.

In November 2016, the AT-802 unit passed to the command of the Israeli Police. The planes continue carrying civilian 4X-format registrations. Most are now based at Megiddo airfield, near Nazareth, due to its proximity to the fire hazard areas. Aside from defending Israel, the AT-802s also saw



Two years after Slovenia faced one of the worst wildfires in its history its 2023 investment in four AT-802 aircraft meant they were able to control the wildfire in the Kras area Miro Majcen/URSZR

Slovenia

Operator	Unit	Base(s)	Quantity	Variant
Administration of the Republic of Slovenia for protection and rescue	URSZR aviation unit	Ljubljana/ Brnik	4	2 x AT-802 Fire Boss
				2 x AT-802A Fire Boss

A view from the cockpit of Slovenian AT-802 Fire Boss preparing to scoop 3,104 litres of water from Lake Bohinj to be offloaded onto a wildfire Rok Perko via Igor Bozinovski

some foreign deployments: Cyprus in 2016, North Macedonia and Montenegro in 2017, and the Turkish Republic of North Cyprus in 2022.

Montenegro

Historically, four AT-802 aircraft appeared in the Montenegrin 40-format civil register with the following Air Tractor factory serials numbers: 802A-0281 (single-seat AT-802A Fire Boss, registered 4O-EAA, written-off in an accident on July 21, 2015), 802A-0294 (single-seat land-based AT-802A, 40-EAB, initially delivered as amphibian-configured Fire Boss then converted into a land-based plane), 802A-0611 (single-seat land-based AT-802A, 40-EAC), and 802-0711 (twin-seat land-based AT-802, 40-EAD).

The Montenegro Ministry of Interior's Aviation-Helicopter Unit (AHJ MUP CG) currently has three land-based AT-802s planes (40-EAB, 4O-EAC and 40-EAD) that operate from Podgorica/Golubovci international airport. Two of these suffered accidents (40-EAB on November 22, 2020, and 40-EAC on June 22, 2022) in which one wing was heavily damaged on each aircraft. The repair of these planes is underway and both aircraft are expected to rejoin the sole-operational twin-seat AT-802 that serves in firefighting and training roles summer 2025.

AHJ maintains its own planes and for serious repairs, and for the training of pilots and mechanics, relies on the Spanish sister-companies Air Tractor Europe (ATE) and Titan. On April 11, 2020, three Montenegrin AT-802s were promptly deployed to neighbouring Bosnia and Herzegovina where they managed, within hours, to control the devastating wildfires raging in the Konjic, Mostar, Čapljina and Prozor-Rama regions.

AHJ MUP CG is considering expansion of the AT-802 fleet with at least two new planes and returning to the concept of using an all-Fire Boss amphibian fleet.

North Macedonia

North Macedonia has an amphibian fleet made up of three single-seat AT-802A Fire Boss planes wearing civilian registrations Z3-BGT (c/n 802A-0280), Z3-BGU (802A-0313) and Z3-BGV (802A-0329). It serves North Macedonia's Protection and Rescue

Directorate (Direkcija za Zaštita i Spasuvanje, DZS), a government institution that uses Titan for pilot training and proficiency checks, logistics and annual aircraft inspections.

Despite being 15 years old, PRD planes are in an excellent technical condition and regularly operate from Skopje international airport. DZS's Flight for Specialized Aircraft Services (Oddelenie za specijalizirani uslugi so vozduhoplovi) urgently needs new pilots to supplement the existing three (of which two are retired but still fly under temporary contracts) and at least one twin-seat AT-802 Fire Boss plane that, aside of increasing the existing fleet capacity, would also serve as a training platform. Future activities would focus on equipping existing planes with new FRDS Gen III systems, replacing the existing with new and more powerful PT6 engines, training at least six new pilots, and acquisition of at least two more Fire Boss planes.

Slovenia

Slovenia is the latest European nation to invest in an AT-802 fire bomber, utilising 85% co-financing provided by the European cohesion policy funds 2021-2027. The incentive came after the devastating Karst wildfire of July 2022 when Slovenia decided to establish a dedicated aerial fire-fighting fleet with a minimum of four AT-802 Fire Boss planes. The agreement for acquisition of the planes was signed on April 17, 2023, between the Slovenian defense ministry and Spanish company Air Tractor Europe (ATE). Two twin-seat land-based AT-802s

The rescEU organisation arranged for four Swedish amphibian-configured Fire Boss water-bombers to go to the Balkans to help fight wildfires last summer. The sole Swedish twin-seater is seen here parked at Petrovec air base, near Skopje Igor Bozinovski

Sweden

Operator	Unit	Base(s)	Quantity	Variant
Saab	Saab company unit	Skavsta/ Nyköping	4	2 x AT-802 Fire Boss
				2 x AT-802A Fire Boss

The international debut of Turkey's newest aerial fire-fighting asset – the AT-802 Fire Boss turbine-powered fire bomber – took place during the European Union-supported IPA Floods and Fires (IPAFF) full-scale field civilian protection exercise in North Macedonia from March 18-22, 2024 via Igor Bozinovski

Turkey

Operator	Unit	Base(s)	Quantity	Variant
Titan Firefighting Services (Spain)	Titan unit in Turkey	Various bases accross Turkey	10	AT-802(A)
General Directorate of Forestry	/		8	4 x AT-802 Fire Boss
				4 x AT-802A Fire Boss

US Special Operations Command reduced its procurement target for the L3Harris OA-1K armed reconnaissance turboprop based on the AT-802 plane to 62 aircraft from the original target of 75, after scrutiny from government auditors L3Harris

This is the oldest aircraft in service in Croatia, a two-seat AT-802 with classical landing gear. It is one of two such planes acquired in 2001 – the other was written off in an accident on September 2, 2004 Croatian Ministry of Defence

Croatia

Operator	Unit	Base(s)	Quantity	Variant
Croatian Air Force	855th Fire Fighting Squadron	Zadar	6	1 x AT-802 1 x AT-802 Fire Boss 4 x AT-802A Fire Boss

were delivered that same year: S5-BZR (c/n 802-0990) arrived at Ljubljana on May 9, followed by S5-BZT (c/n 802-1029) on June 18. These aircraft returned to Spain in September 2023 where Wipaire 10,000 floats were installed, resulting in change of their designation from AT-802 into AT-802 Fire Boss.

The four-strong fleet was completed in the first half of 2024 when additional two single-seat land-based AT-802A planes landed in Slovenia: S5-BZS (c/n 802A-1088) on May 18 and S5-BZU (c/n 802A-1092) on June 28. As with the first two planes, the single-seaters returned to Spain in autumn 2024 where they got floats and became AT-802 Fire Boss amphibians.

The Slovenian aircraft are operating under civilian S5-format registrations within a special aerial firefighting unit that was promoted on May 15, 2024, as a unit of the Ministry of Defence's subordinated Administration of the Republic of Slovenia for protection and rescue (Uprava Republike Slovenije za zaščito in reševanje, URSZR). To put the unit into operational use, pilot and technical personnel training was organized by ATE which contributed to successfully using the new Air Tractors in summer wildfire extinguishing operations.

While various airports across Slovenia would be used for the purpose, the AT-802's home base will be Ljubljana/Brnik international airport where a hangar would be built to accommodate the new URSZR unit. Two additional Fire Bosses will probably be purchased in the period 2025-2026.

Sweden

Sweden was totally unprepared for fighting the wildfires that occurred in 2014 and again in 2018. The Portuguese National Authority for Emergency and Civil Protection promptly dispatched two of its AT-802A Fire Boss planes leased from Agro-Montiar.

The positive experience and know-how accumulated resulted in the April 2020 decision by the Swedish Civil Contingencies Agency (Myndigheten för samhällsskydd och beredskap, MSB) to award Saab Aircraft Company with a four-year contract under which initially two and then four AT-802 Fire Boss planes (two single-seat and two twin-seat aircraft) would be procured and serve on fire-fighting duties in Sweden and other EU countries from April to September, until 2023.

The first aircraft was a single-seat AT-802A Fire Boss, with Swedish civil registration SE-MHM on October 4, 2019. A twin-seat AT-802 Fire Boss followed, registered SE-MHN on May 15,2020. An additional two Fire Bosses (single-seat SE-MHO and twin-seat SE-MHP) arrived in Sweden in 2021. Based in Skavsta Airport in Nyköping, these aircraft are tasked with strengthening the country's own firefighting capabilities as well as that of Northern Europe's ability to fight forest fires – they can reach southern Finland in two hours and Luleå in the far north of Sweden in three hours.

Owned and operated by Saab, these planes have already deployed beyond Swedish borders: to Greece in August 2021, to the Czech Republic in July 2022, to France in August 2022, in Greece in 2023, and in North Macedonia and Bulgaria during the summer of 2024.

Turkey

After a devastating wildfire summer in 2021 when more than 250,000 hectares burned and a high number of victims and enormous

The Cyprus Department of Forests aims to increase the nation-owned AT-802 fleet to four land-based planes. Until then, Cyprus will continue to rely on leased AT-802s while operating its sole, land-configured AT-802 (FD-1, 802-0335) acquired in February 2009 via Igor Bozinovski

Israeli Air Tractor AT-802 (registration 4X-AFA) flying in North Macedonia airspace during the 2017 deployment of two such aircraft sent to Skopje to assist in tackling devastating wildfires IP-PRD via Igor Bozinovski

Cyprus

Operator	Unit	Base(s)	Quantity	Variant
Cypriot Department of Forests	Flight Unit Section	Larnaka, Akrotiri,	1	1 x AT-802
Titan Firefighting Company	Titan flight in Cyprus	Paphos	4	4 x AT-802(A)

economic damage caused, the Turkish government signed an agreement with Titan in the spring of 2022 to lease ten land-based AT-802 for the period 2022-2024. In the first year of the agreement, a significant reduction in the burned area (only 15,000 hectares) was achieved, with wildfires regularly extinguished in the first hours of their appearance. Two of the leased planes were also sent to assist in extinguishing wildfires in the Turkish Republic of North Cyprus and in Georgia.

Impressed by the AT-802 performances, the Turkish Ministry of Agriculture and Forestry and ATE signed agreement on February 16, 2023 for the purchase of 20 AT-802 aircraft, 15 in Fire Boss and five in ground-based configuration, together with a related training and integrated logistical support (ILS) package for seven years. Under the agreement, delivery tempo of four aircraft annually is planned so that the operator General Directorate of Forestry (ORMAN Genel Müdürlüğü, OGM) will complete the 20-strong AT-802 fleet by 2027.

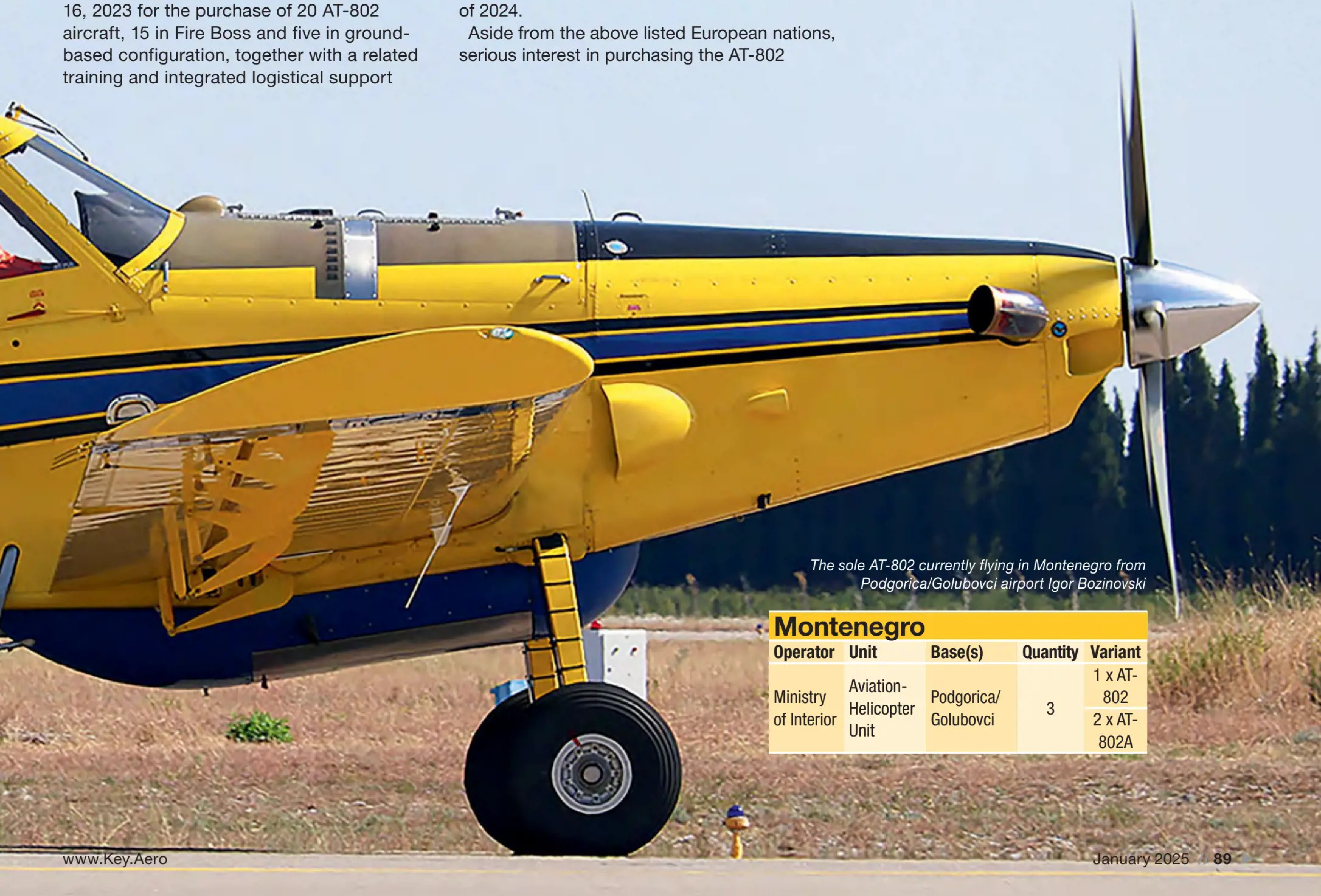
Two twin-seat and two single-seat Fire Boss amphibians, respectively registered OR-2022, OR-2023, OR-2024 and OR-2025, were delivered to Turkey in March and April 2023 and publicly presented to the Turkish President Recep Tayyip Erdoğan on May 3, 2023, at Etimesgut air base, west of the capital Ankara. This year, Turkey acquired an additional four AT-802s: one each single-seat (OR-2038) and twin-seat (OR-2036) plane with conventional landing gear; and one each single-seat (OR-2026) and twin-seat (OR-2021) amphibious-configured Fire Boss planes. Turkish-owned AT-802s were deployed to extinguish wildfires in North Macedonia and Greece in the summer of 2024.

Aside from the above listed European nations, serious interest in purchasing the AT-802 firebomber has also been demonstrated by Albania, Bosnia-Herzegovina and Bulgaria, three Balkan nations regularly affected by summer wildfires.

Israel

Operator	Unit	Base(s)	Quantity	Variant
Israeli Police	Aerial Firefighting Unit	Megiddo	14	AT-802

Thirty-four years after its first flight, the AT-802 still attracts new customers in need of a reliable and efficient aerial firefighting platform. Aside from its European military and civil protection users, it is in service with governments and private operators in the United States, Canada, France, Germany, Greece, Italy, Luxemburg, Portugal, Spain, Australia, Indonesia, Gambia, Burkina Faso (Air Force), Algeria, South Africa, Chile, Argentina, Columbia, Mexico, Uruguay, Brazil and Saudi Arabia. **afm**

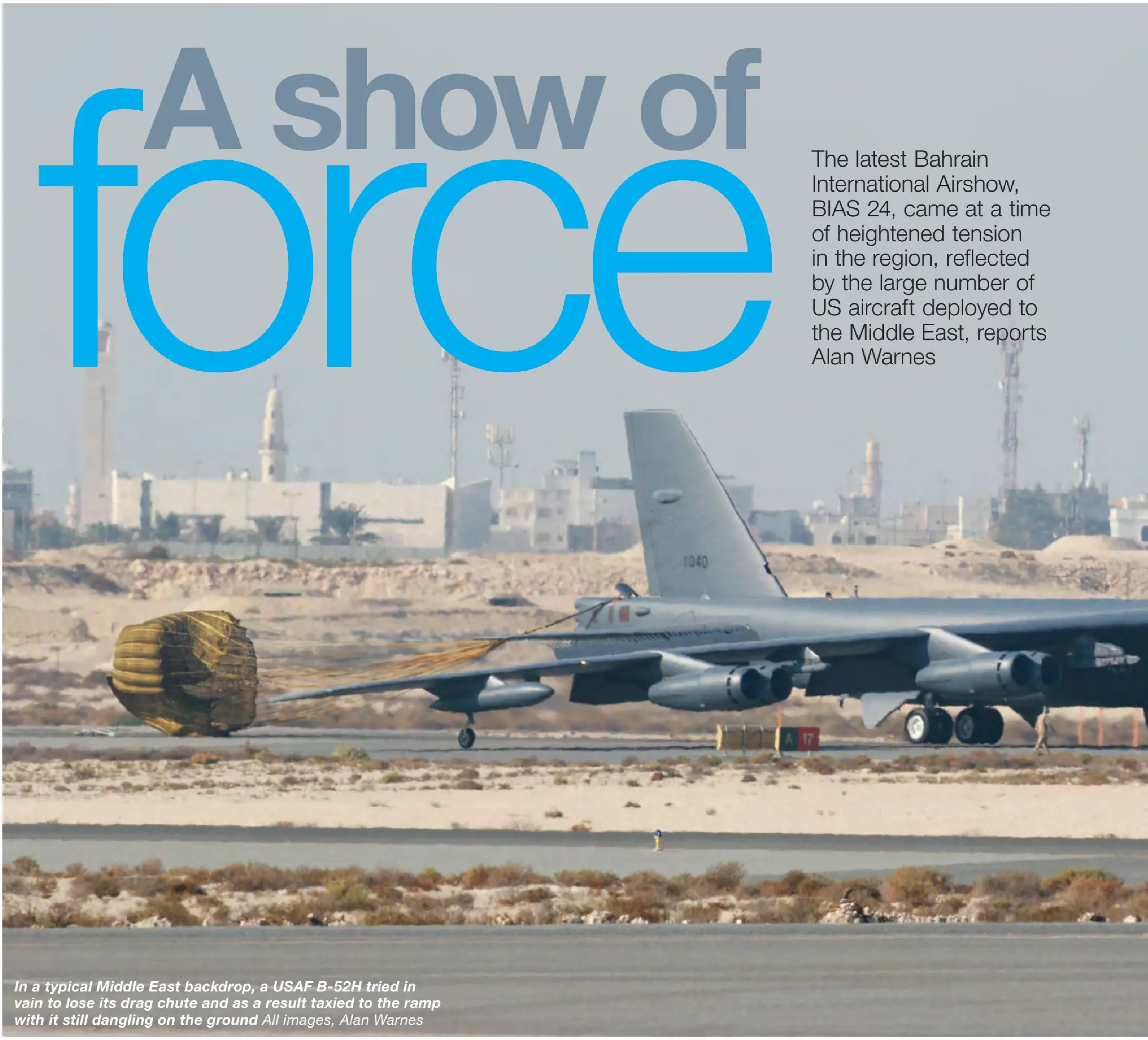

The sole AT-802 currently flying in Montenegro from Podgorica/Golubovci airport Igor Bozinovski

Montenegro

Operator	Unit	Base(s)	Quantity	Variant
Ministry of Interior	Aviation-Helicopter Unit	Podgorica/Golubovci	3	1 x AT-802 2 x AT-802A

A show of force

The latest Bahrain International Airshow, BIAS 24, came at a time of heightened tension in the region, reflected by the large number of US aircraft deployed to the Middle East, reports Alan Warnes



In a typical Middle East backdrop, a USAF B-52H tried in vain to lose its drag chute and as a result taxied to the ramp with it still dangling on the ground *All images, Alan Warnes*

What better way for the US to provide a show of force and unity with its Bahraini allies than by sending a Boeing B-52H bomber to the biennial international air show at Sakhir Air Base… or sending another pair to open the flying display, with not just one or two, but three formation flypasts, at around 5,000ft, on the second day! With most of the visitors to the Bahrain show in November knowing the bombers' arrival time, you had the spectacle of everyone pouring out of the exhibition hall to witness them. If you manged to miss the first flypast, you could always catch the second or third, as it took the pair another ten minutes or so to re-circle.

As Colonel Andy 'Cuffs' Ladd, from the US Central Command (CENTCOM), told the author: "We are here to illustrate our support for Bahrain and our Middle East allies. This sends out a clear message to the enemy, that while we have no desire for a war, if we do we will completely dominate them."

On Day Two of BIAS 2024, this pair of B-52Hs made three formation fly-bys in a show of strength for its allies in the region

Above: ***Crown Prince of Bahrain, Prince Salman bin Hamad Al Khalifa, Deputy Supreme Commander of the Armed Forces and Prime Minister (left) was shown around the 'Buff' in static by USAF Colonel Andy 'Cuffs' Ladd (right) from CENTCOM. Walking behind is Lt Gen Derek France, Air Forces Central (AFCENT) Commander***

Left: ***The A-10C 'tank buster' from the 23rd Fighter Wing in static would have appealed to many of the visitors at the show***

The bombers were among six deployed to the region from the 5th Bombardment Wing at Minot Air Force Base (AFB), North Dakota, that the USAF had announced on November 3. This was the first time B-52s had deployed to a base in the Middle East since 2019. According to the USAF, "they were providing fresh air power designed to compensate for the upcoming departure of the USS *Abraham Lincoln* carrier strike group. It also comes as senior Iranian officials have threatened to attack Israel following its retaliatory airstrikes on Iranian air defences and ballistic missile production sites on October 26".

'Buffs' delight

This was also the first time a 'Buff' had made an appearance at a Middle East aerospace show, and the Crown Prince of Bahrain, Prince Salman bin Hamad Al Khalifa, Deputy Supreme Commander of the Armed Forces and Prime Minister was so pleased, he jumped in his golf buggy and drove up to the bomber surrounded by his security personnel to receive an escorted tour from Colonel Ladd.

The 60-year-old bomber (serial number 61-0040) had made quite an entrance the day before. After taxiing off the end of the runway, it sat for about ten minutes trying to dislodge the huge deployed brake chute. With no luck, the pilot opted to taxi to the static ramp dragging the chute behind him. For many in attendance this was probably their first opportunity to see the huge USAF icon with its eight engines up close. I asked Col Ladd why the 'Buff' had no unit markings and was told: "It is down to operational security that has to be maintained to protect operations. There are obviously certain things we can do and removing the markings is one."

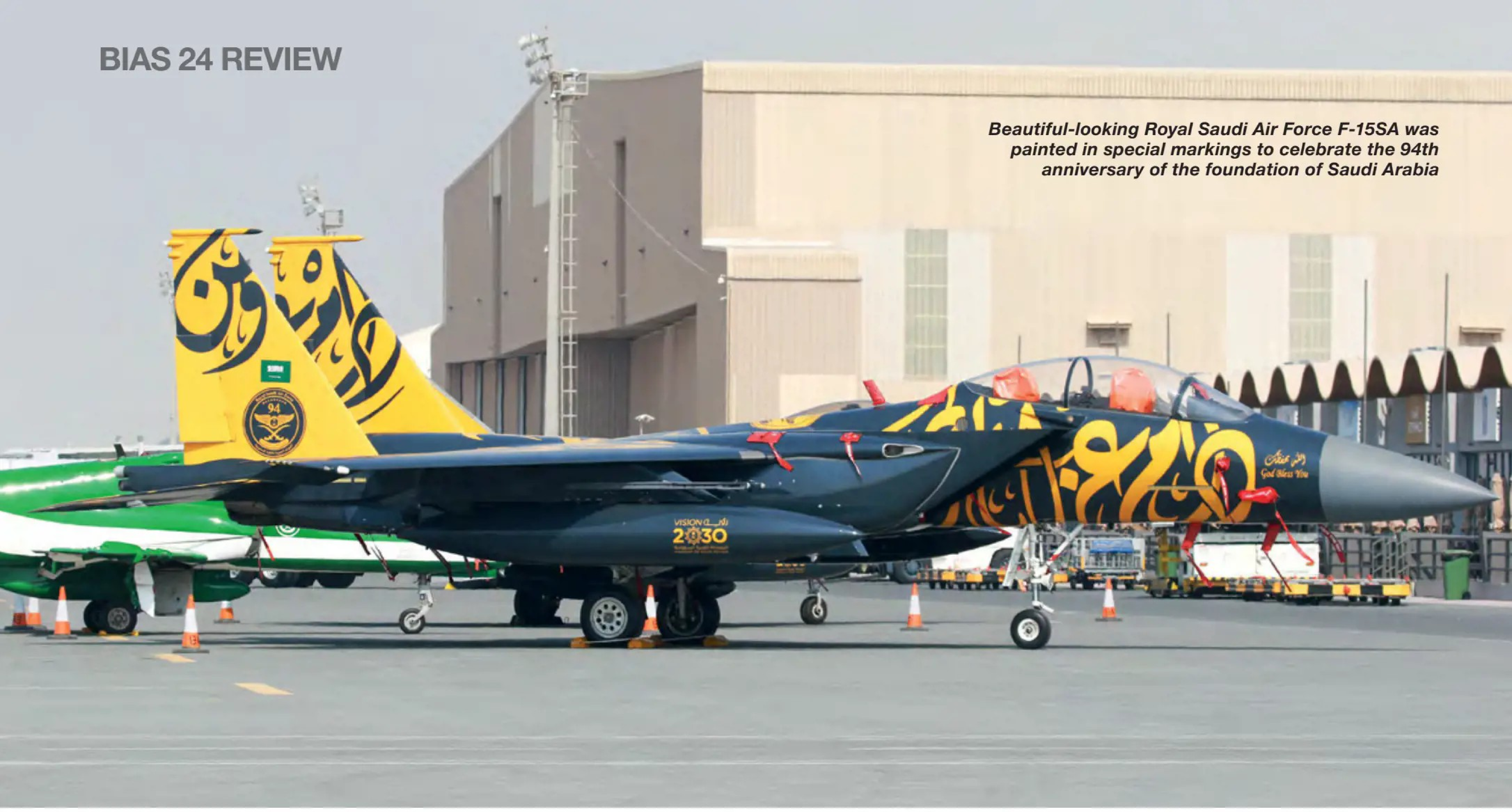
Showing US steel

Another anonymous exhibit parked close by was an unmarked C-130J Hercules (serial 08-3172 stencilled along the side), owned by the 317th Airlift Wing at Dyess AFB, Texas, but one of 12 operated by CENTCOM in the Middle East (see *Secretive Super Hercs*, *Combat Aircraft Journal*, December, p56-61). Meanwhile, a menacing-looking A-10C 'tank-buster' from the 74th Fighter Squadron/23rd Fighter Wing at Moody AFB, Georgia, was showing off its ferocious shark's mouth paint scheme, with a 30mm GAU-8 gatling-gun – which can do some serious damage – under the nose. The spare Pacific Air Forces demo team F-16CJ that had parked on the flight line for the previous two days, was towed into the area for the third day. Both the fighters had been deployed to the region due to recent uncertainty.

A US Navy MH-53E Sea Dragon, one of four serving the Helicopter Mine Countermeasures Squadron (HM)-15 'Blackhawks' detachment based at nearby Muharraq in Bahrain was also present. There are currently 28 MH-53Es remaining in service, but the fleet will start being phased out in 2025, with all of them retired by the end of 2027. Could this be the last BIAS for the MH-53E?

Bahraini favourites

The Royal Bahraini Air Force (RBAF) had its usual presence at the far end of the ramp, but there was no sign of the new F-16 Block 70s that started being delivered in March. Of the ten single-seaters and six dual-seaters on order, six single-seaters and three dual-seaters have been delivered. RBAF Commander Major General Shaikh Hamad bin Abdullah Al Khalifa told the author that they are being used to train pilots and groundcrews, and expected them to be fully operational in the near future: "The project is not completed yet, and we still need more



Beautiful-looking Royal Saudi Air Force F-15SA was painted in special markings to celebrate the 94th anniversary of the foundation of Saudi Arabia

An upgraded AH-1FB, fitted with an Aselsan EO/IR turret on the nose, hover taxies into the show the day before it opened

HM-15 has a detachment at Muharraq in Bahrain, flying four MH-53Es in the anti-submarine warfare mission. They start being retired from US Navy service in 2025

equipment. Our older but capable Block 40s have been fitted with very advanced equipment [in an upgrade] and we can get a lot out of them. Once we have finished with the introduction of the Block 70s, we might alter the role of the Block 40s."

The RBAF showed off several of its favourites, including a F-16 Block 40, Hawk Mk 129, F-5E, UH-60M, and an upgraded AH-1FB, plus one of the 12 relatively new AH-1Z Zulus and a Bell 505 training helicopter, one of the three that was delivered in March 2023.

A Bell 412EP of the police force was also parked nearby alongside a civil Airbus H145, that according to one of the aircrew could replace the Bells in the near future, although he was careful not to give too much away!

Foreign visitors

The Royal Saudi Air Force (RSAF) is now a regular at Middle East aerospace shows. The 'Saudi Hawks' aerobatic team was making its last international appearance with the Mk 65s as they prepare to take on the newer Mk 165 (see news pages). A small static display of three RSAF jets sitting opposite the VIP pavilion, comprising a 'Saudi Hawks' Hawk and two specially marked RSAF fighters, a Boeing F-15SA and Eurofighter, to celebrate the 94th anniversary of Saudi Arabia's unification. Handing out small bags of mixed dates for those passing by was a nice gesture.

Once again, the Pakistan Air Force was present. It was exhibiting a Block 3 JF-17C in the static display (see news) as well as participating in the air display with older JF-17s. Two were parked on the flight line, which incidentally had been moved from its normal position at the top of the ramp to the bottom, possibly because there was only a handful of flying aircraft. One of the JF-17s, usually from the 14 Sqn 'Tail Choppers' flew in the display while the back-up example wore the marks of 28 Sqn 'Phoenix'. An Il-78 had visited before the show, providing the support equipment and personnel for the three fighters.

Tucked away in the corner of the static display were a United Arab Emirates Air Force and Air Defence F-16E Block 60 and a Mirage 2000-9. But there was no display routine from the jets, as there normally is. The Mirage 2000-9 always made a very low departure from the Sakhir runway whenever it flew at BIAS, but not this year.

The one-and-a-half-hour air display always occurred in the afternoon, starting at 1.30pm, with three formations of RBAF aircraft flying through – three F-16 Block 40s, followed by three Hawk Mk 129s and three F-5s. With the sun by now on the other side of the runway, the spectators were watching all the action unfold in the haze while staring into the sun. The Indian Air Force 'Sarang' aerobatic team and its HAL Dhruv helicopters parked at the far end of the base instead of the flight line flew in these brutal conditions during the flying display. Undoubtedly the event of the day was by the British display team 'Global Stars' and its four Extra 330s led by Mark Jefferies that took place in the evening sunlight, wooing the crowd in and outside the base with aerobatics enhanced by pyrotechnics that bled off the wing tips to light up the dusk…

Over the past few years there have been announcements by the RBAF on future acquisitions, but this year there were none. I asked the RBAF Commander about this and he responded: "We have bought AH-1Z Zulus, F-16s, Patriots and Bell training helicopters in recent years and now we are having to pay for them!"

BIAS is always an enjoyable event, the last international airshow of the year, held under the glorious November sunshine. **afm**

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Kunsan F-16 crash report released

The aircraft lost on December 11, 2023: USAF/8th Fighter Wing F-16CM 88-0479 'WP' during a mission on June 18, 2019 *USAF*

A UNITED States Air Force Aircraft Accident Investigation report into the loss of an F-16 from Kunsan Air Base, Republic of Korea (ROK), in 2023 (see *Attrition*, February 2024) was released on September 26.

On December 11, 2023, at 0823hrs local time (L), the mishap pilot (MP) assigned to the 35th Fighter Squadron (FS) 'Pantons', took off for a local training flight in mishap aircraft (MA) F-16CM tail number 88-0479 'WP', assigned to the 80th Fighter Generation Squadron (FGS), with both squadrons being assigned to the 8th Fighter Wing, Kunsan Air Base (AB).

At approximately 0842hrsL, while transiting through the local training airspace, the MP ejected from the MA with no injuries at an approximate altitude of 1,731ft mean sea level (MSL) using the aircraft's ACES II ejection seat. The MA impacted the water approximately 81nm (150km) west of Kunsan AB in the Yellow Sea and was destroyed. The mishap resulted in the loss of a $28,259,045.00 USAF aircraft. The Crash Survivable Memory Unit (CSMU), or 'black box', containing all MA forensic information, was not available at the time of this report.

The mishap flight (MF) was a continuation training sortie executing a defensive counter air (DCA) mission scenario. This was the first flight of the day for all pilots in the MF. The MP was flying as number three of a formation of four F-16s, callsigns 'Somaek 11 to Somaek 14', with the MA being 'Somaek 13'. The MF's training scenario involved defending a portion of the training airspace from a second formation of four F-16s, Ares flight and 35th FS, simulating adversary aircraft.

Weather in the training areas were worse than forecasted, with dense cloud coverage throughout. Due to the airfield weather preventing the MF from maintaining visual contact with one another, MF1 directed the MF to conduct a radar assisted trail departure (RATD). During a RATD, each member of the MF flies 2-3nm (4-7km) in trail of the preceding aircraft, using the on-board aircraft sensor information to maintain spacing and deconfliction.

At approximately 0837hrsL, while transiting through the training airspace in instrument meteorological conditions (IMC), in clouds, the MP lost the 'attitude indicator', the primary instrument indicating where the horizon is relative to his aircraft. This uses information provided by an embedded global positioning system inertial navigation system (EGI), which failed. The MP immediately transitioned to the only remaining attitude information available, the standby attitude indicator (SAI).

Earlier in the mission, while taxiing to the end of the runway prior to take-off, the MP observed slight pitch and bank errors on the SAI, increasing the difficulty of reconciling attitude from the SAI with the MA airspeed and attitude information, exacerbating overall disorientation. During the investigation, most of the pilots interviewed testified to routinely seeing poorly performing SAIs. Once stationary at the end of the runway and more than two minutes before take-off, the MP had re-caged the SAI, correcting the errors.

With the help of a wingman flying in trail, communicating navigation and altitude information, the MP started a descent to an expected cloud-free sky. Still in IMC at 3,000ft (914m) MSL, the MP attempted to level off but became further disoriented. The MP's confidence in the MA's attitude continued to decrease, now nearing the water, and the decision was made to eject.

There was a cloudbase of around 500ft (150m), making location of the ejected MP difficult for airborne fighter aircraft. However, approximate location was determined by MF4, along with numerous Osan AB and Kunsan-based aircraft. The closest recovery asset was a ROK Navy ship, which recovered the MP at 1031hrs. After being treated for hypothermia, the MP was transported back to Kunsan AB by a ROK Coast Guard helicopter.

Summing up, the investigating officer, Col Philip D Lancaster, stated: "I find, by a preponderance of evidence, the cause of the mishap was an EGI failure while in IMC. The malfunctioning EGI led to a loss of primary flight and navigation instruments. I also find by a preponderance of the evidence that the subsequent reliance of the MP on the MA's SAI, which previously displayed abnormal indications, and the spatial disorientation of the MP, substantially contributed to the mishap."

Accident Reports

D: Jan 20, 1995

N: US Army/Company F/1-212 AVN

T: UH-60A Black Hawk

S: 84-23998

Correcting previous reports (see *Attrition* June 1996 and October 2000), the Black Hawk that crashed on this date was 84-23998 not 84-23997. The unit is now known, as given above. It is also confirmed that the helicopter was destroyed in the crash – reports of it having been rebuilt were erroneous and were due to the wrong serial being quoted for the mishap aircraft. The Black Hawk was returning to base after a qualification course flight when it experienced an abrupt, severe pitchdown of the nose. It entered a near vertical nose-down descent from which the crew were unable to fully recover before it impacted the ground, flipped upside down and caught fire.

D: Jun 9, 2006

N: US Army/50 MED (AA) not A Company/1-159th AVN

T: UH-60A not L

S: 86-24523

Updating the original report on this accident in Kentucky (see *Attrition*, August 2006), the serial, correct variant and unit are now known, as given above.

D: Jan 20, 2007

US Army/Alabama Army National Guard/C/1-131 AVN

T: UH-60A Black Hawk

S: 84-23984

Adding to previous reports of this loss in Iraq (see *Attrition*, March, April and May 2007), identity of the helicopter and correct unit are as given above. Note also that it was a UH-60A, not a UH-60L. the Black Hawk initially took a direct hit from a shoulder-launched rocket and caught fire. As it approached to land it was struck by significant machine gun fire which severed the flight controls. It then climbed to 150ft and turned sharply towards the ground before making a hard impact in Tarkhya, south of Baquba.

D: Aug 19, 2009

N: US Army/D/1-160th SOAR

T: MH-60K

S: 91-26378

Adding to the original report of this loss in Colorado (See *Attrition*, October 2009), the identity of the helicopter involved is now known, as given above. Investigation concluded the crew's flight plan did not take into account the performance limits at the altitude of 14,200ft at which it was being flown.

D: Oct 29, 2024

N: Israeli Air Force

T: Elbit Hermes 900 Kochav

Thia UAV was destroyed when it was shot down by Islamic Resistance/Hezbollah militants near Tayr Harfa, in southern Lebanon. Video footage released by Hezbollah appears to show the aircraft being engaged and destroyed by a surface-to-air missile system.

D: Oct 30

N: Iranian Islamic Revolutionary Guards Corps Air Force

T: Unidentified helicopter

This helicopter was substantially damaged when it crashed due to a technical defect during a routine training flight near Zarin Dasht city, Fars Province. Several occupants suffered superficial burns and were taken to hospital for treatment.

D: Oct 30

N: Air Force of the Democratic Republic of the Congo

T: Mi-24 Hind

This helicopter crashed at 1100hrs local time under unknown circumstances at N'Dolo Airport, Kinshasa. One of those on board was killed in the crash, while two others were seriously injured and later died from the injuries sustained in the accident. The helicopter was destroyed by fire.

D: Nov 1

N: Brazilian Air Force/Air Force Academy/1° EIA

T: 2 x T-27 Tucano

While on a routine training flight from the Air Force Academy at Pirassununga-Campo Fontenelle, these two aircraft collided in mid-air over a rural area of Pirassununga, São Paulo. One aircraft crashed and was destroyed, although the pilot was able to eject safely. He was recovered by FAB rescue personnel and taken to the AFA Hospital; although he did not have any immediately apparent injuries. The other was able to land without further incident.

D: Nov 1

N: Brazilian Air Force/GEIV

T: Hawker IU-93A (Hawker 800XP)

S: FAB6050

After taking off from Petrolina Internacional Airport, Pernambuco state, at 0915hrs local time and climbing to 25,000ft (7,620m) this calibration aircraft declared an emergency and made an emergency landing at Recife-Guararapes International Airport, Pernambuco state, at 1100hrs. It is unclear whether or not it sustained any damage, but it was able to taxi unaided to the apron, followed by emergency vehicles. It is believed to have had an engine failure. No injuries were reported.

D: Nov 1

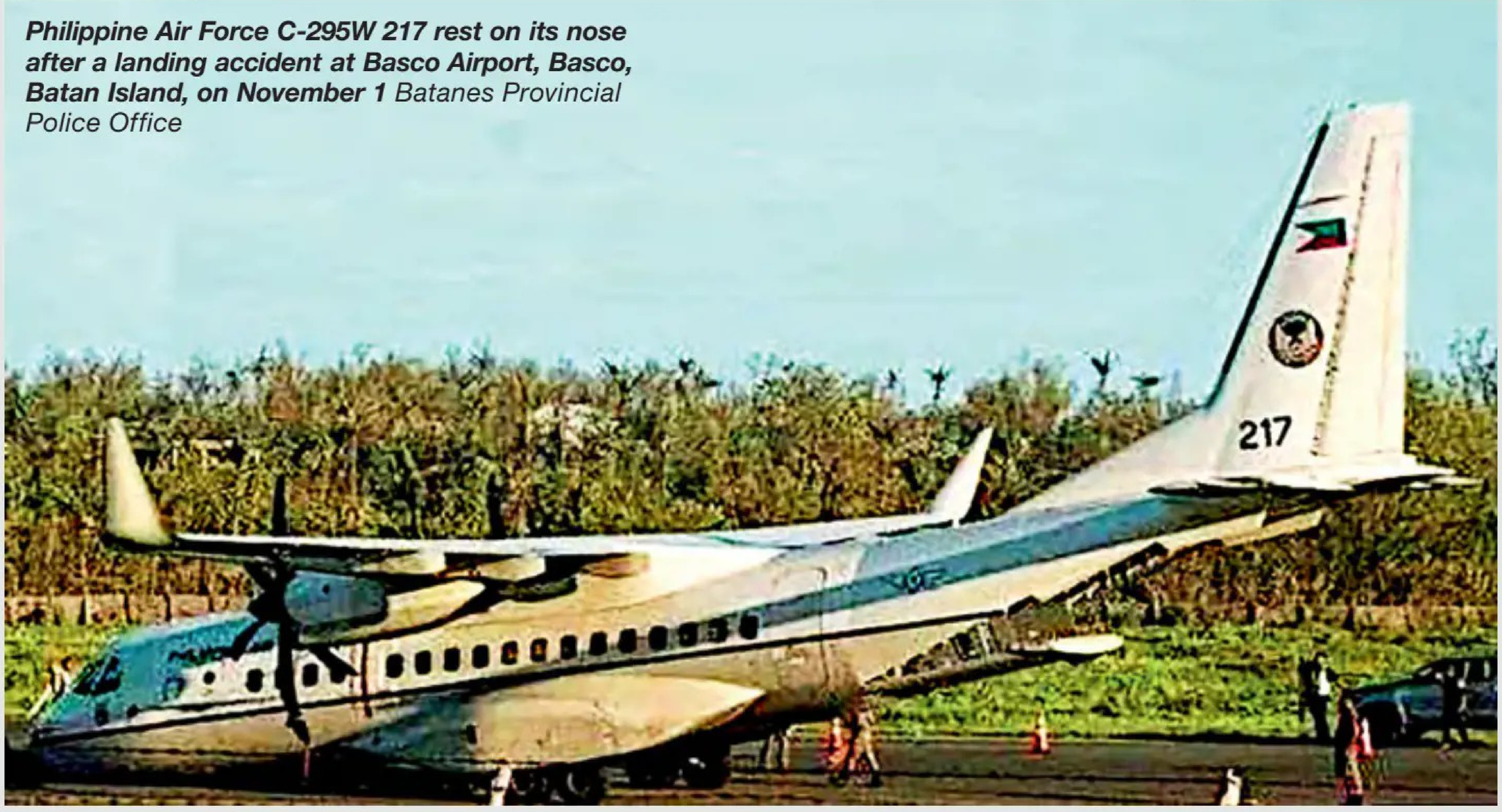
N: Japan Air Self-Defense Force/3rd Air Wing

T: F-35A Lightning II

S: 39-3737

This aircraft overran the runway on landing at Marine Corps Air Station Iwakuni, Japan, at around 1100hrs local time. As a result, the airfield was temporarily closed while the F-35A was recovered. The pilot was unhurt and the aircraft did not appear to have sustained any serious damage,

***Wreckage of US Army MH-60K 91-26378 following its high-altitude crash in Colorado on August 19, 2009** US Army*



***Philippine Air Force C-295W 217 rest on its nose after a landing accident at Basco Airport, Basco, Batan Island, on November 1** Batanes Provincial Police Office*

Attrition Report

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Swiss Air Force Eurocopter EC635P2+ T-367 after its crash in Alpnachstad, Obwalden, on November 7 *VBS*

D: Nov 1
N: Philippine Air Force
T: C-295W
S: 217

While landing at Basco Airport, Basco, Batan Island, at approximately 1600hrs local time to deliver relief supplies to Super Typhoon Leon victims, the nose undercarriage collapsed and the aircraft veered off the runway. There were no injuries and damage appeared to be minor. Following the accident, the airport was closed until November 3.

D: Nov 1
N: Russian Air Force
T: Su-34

This aircraft was destroyed when it crashed at an unspecified location. Both crew members were killed.

D: Nov 2
N: Republic of Korea Army
T: IAI Heron I

At 0200hrs local time, this UAV crashed under unknown circumstances in Yangju, about 15 miles (25km) northeast of Seoul, near the border with North Korea. At the time it was returning from a surveillance mission following a recent North Korean intercontinental ballistic missile launch. Military personnel recovered the wreckage 15 hours later. Officials did not acknowledge the loss until making an official announcement on November 5.

D: Nov 4
N: Indian Air Force
T: MiG-29 Fulcrum

This aircraft crashed under unknown circumstances 15 miles (24km) from Agra, Uttar Pradesh, while en route from Adampur Air Force Station to Agra AFS for an exercise. The pilot ejected safely.

D: Nov 4
N: Iranian Islamic Revolutionary Guards Corps Air Force
T: Gyrocopter

While participating in a combat operation in the Sirkan region, this gyrocopter was destroyed in a crash. Both those on board, General Hamid Mazandarani, commander of the Nineveh Brigade in Golestan province, and Hamed Jandaghi, a pilot in the IRGC ground forces, were killed.

D: Nov 5
N: Egyptian Air Force
T: Unidentified helicopter

While on a training flight in the Shalofa area, Suez Governorate, this helicopter had a technical malfunction, crashed and was destroyed. Both crew members were killed.

D: Nov 5
N: unknown
T: Bayraktar TB2?

This unidentified UAV crashed near the Al-Shabaab-controlled village of Farsooley, near the town of Qoryooley, in the Lower Shabelle region of Somalia, approximately 80 miles (130km) southwest of Mogadishu. It was described by local sources as "a Turkish-made drone armed with missiles". The operator was unknown. Al-Shabaab fighters quickly secured the crash site and covered the wreckage with tree branches to prevent detection by aerial reconnaissance.

D: Nov 6
N: Ukrainian Main Directorate of Intelligence
T: Aeroprakt A-22 Foxbat (modified)

This light sport aircraft, modified into an unmanned attack aircraft configuration, was destroyed when it crashed into the Kaspiysk Naval Base, Republic of Dagestan, which is a base for the Russian Navy's Caspian Sea Flotilla. However, it missed the docks and crashed into a nearby parade ground, exploding on impact.

D: Nov 6
N: Ukrainian Main Directorate of Intelligence
T: Aeroprakt A-22 Foxbat (modified)

This light sport aircraft, modified into an unmanned attack aircraft configuration, was destroyed when it was shot down while attempting to attack the Kaspiysk Naval Base, Republic of Dagestan. It missed its target and came down in the vicinity of the Dagdizel industrial complex. This was the second loss of the type on this date and a separate incident to the one above.

D: Nov 6
N: Vietnam People's Air Force/940th Aviation Regiment
T: Yak-130
S: 2101

After taking off at 0955hrs for a routine training flight from Phu Cat Air Base the pilot reported while returning at 1038hrs that he was unable to lower the undercarriage. After all attempts to free it failed, the two crew members (Regiment Commander Colonel Nguyen Van Son and Chief Flying Instructor Colonel Nguyen Hong Qua) ejected safely at 1051hrs over a mountainous area near the TB2 firing range in Binh Hoa, Tay Son district, Binh Dinh province They were rescued several hours later from a forested area. The aircraft was destroyed in the subsequent crash. The serial number 210D was quoted by local media, but Vietnamese Yak-130 serials are in the 2101 to 2109 range and the correct identity is believed to be 2101.

D: Nov 7
N: Russian Air Force/15th Army Aviation Brigade
T: Kamov Ka-52

This helicopter was destroyed in a crash at an unspecified location in Russia. Although both crew members ejected, the pilot (identified as Ilya Noskov) was killed and the navigator injured.

D: Nov 7
N: Swiss Air Force
T: EC635P2+
S: T-367

While returning to Alpnach Air Base after a training flight to Graubünden, this helicopter crashed in Alpnachstad, Obwalden, at around 1930hrs. The two crew were uninjured and able to exit the EC635 unaided but were taken to hospital as a precaution. The helicopter rolled over onto its port side on impact and sustained extensive damage.

D: Nov 8
N: US Air Force
T: MQ-9A Reaper

This UAV was claimed to have been shot down by Houthi rebels while flying over Al Jawf Governorate, Yemen, video footage showing it coming down in flames and of burning wreckage on the ground appeared to confirm the claim.

D: Nov 9
N: Kazakhstan Air Defence Force
T: Mi-8MT

This helicopter was destroyed when it made a hard landing at around 1140hrs local time near the village of Saryzhar in the Marktuk district of Kazakhstan's Aktobe region, following which it was destroyed by a post-crash fire. One crew member was killed and the two others were seriously injured and airlifted to regional medical facilities in Aktobe.

The burning wreckage of a Kazakhstan Air Defence Force Mi-8MT after it made a hard landing on November 9 in Kazakhstan's Aktobe region *via Twitter*

Paraguayan Air Force Cessna T206H Stationair TC 0235 at Guaraní International Airport, Minga Guazú, after it veered off the runway due to a nose undercarriage leg failure on November 17 FAP

D: Nov 10

N: Myanmar Air Force

T: Mi-17

After being shot at by members of the Arakan Army, this helicopter was struck in the tail and made an emergency landing at around 1400hrs local time near Kan Pauk village, Sidotkaya Township, Magway Region. It was not reported whether the Mi-17 sustained any major damage and it is unclear whether there were any injuries to those on board. The helicopter had just left Myanmar military's Western Command headquarters at Ann Township in Rakhine State after transporting reinforcements, weapons and ammunition to assist in the fight against the Arakan Army.

D: Nov 10

N: Russian Air Force

T: Mi-24 Hind

An unknown saboteur set fire to this helicopter on the ground at Klin Air Base in Russia's Moscow Oblast. The extent of damage to it is unconfirmed but is thought to have been substantial.

D: Nov 11

N: Japanese Air Self-Defense Force

F-15J/DJ Eagle

While on a training flight over the Sea of Japan, the aircraft encountered a malfunction in its fuel system and the pilot declared an emergency. It was flown back to its base at Komatsu, where a safe emergency landing was made at 1354hrs local time. The runway was then temporarily closed, delaying the arrival of two commercial flights by 20 minutes.

D: Nov 15

N: US Air Force/137th SOW/ L3Harris Technologies Flight Capital LLC

T: Air Tractor OA-1K Sky Warden (AT-802U)

S: 22-1007/(N8035H)

While landing at Oklahoma City-Will Rogers Airport, Oklahoma, at 1247hrs local time, the aircraft overshot the runway. It was damaged when it tipped over on its nose, causing the propeller to strike the ground. Although still officially registered with the FAA as N8035H, the aircraft was operating with a military serial number and is one of two being used to train USAF pilots on this new armed overwatch type at Will Rogers Air National Guard Base.

D: Nov 16

N: Ethiopian Air Force

T: unidentified helicopter

This helicopter reportedly crashed at around 1200hrs local time after being fired on while landing at at Belay Zeleke International Airport, Bahir Dar. Leaders of the Fano militia claimed responsibility for the attack, which they said resulted in the death of three of those on board. The Ethiopian Government said in a statement that reports were 'misleading and baseless,' but confirmed that Western Air Command had been undertaking a routine training exercise at the time. The statement said that "no helicopter was harmed or faced any mishap during these operations." However, airport officials stated that the crash had taken place, without giving further information. All flights from the airport were suspended after the incident, which the government said was merely for safety during the military operations, after which normal flights resumed.

D: Nov 17

N: Paraguayan Air Force

T: Cessna T206H Stationair TC

S: 0235

While landing at Guaraní International Airport, Minga Guazú, at approximately 2320hrs local time, after a flight from Concepción, the aircraft experienced a nose undercarriage leg failure and veered off the runway. There were only minor leg injuries sustained by the three on board (1st Lt Niulsa Atumar, 2nd Lt Roberto Insanurralde and Sgt Domingo González) and they were transferred to Asunción for medical care. The Cessna appeared to have sustained only minor damage to the undercarriage.

D: Nov 18

N: Israeli Air Force

T: Elbit Hermes 450 Zik

This UAV was destroyed when it was shot down at 2200hrs local time by Islamic Resistance/ Hezbollah militants near Taybeh in the Marjayoun District of southern Lebanon's Nabatieh Governorate. A video released by Hezbollah appears to show it being downed by an Iranian-origin 358 air defence system.

D: Nov 21

N: Royal Moroccan Air Force/ Centre d'Instruction des Pilotes de Ligne

T: Diamond DA42NG Twin Star

S: CN-PLO

This aircraft was destroyed in a crash at around 1000hrs local time shortly after take-off for a training flight from Ben Slimane Airport. It came to rest inverted and broken up in a wooded area. Both crew members (RMAF officers Colonel Mohamed Mokhtari and Major Fathi Omar) were killed.

D: Nov 22

N: Ukrainian Air Force

T: MiG-29 Fulcrum

While parked on the ground at Dnipro International Airport, Dnipro, Dnipropetrovsk Oblast, Ukraine, the aircraft was destroyed after being targeted and struck by a 9K720 Iskander mobile short-range ballistic missile with a cluster warhead launched by Russian forces.The attack was officially acknowledged in a statement by the Russian Ministry of Defence.

D: Nov 24

N: Pakistan Air Force

T: Piper PA-46-600TP M600

S: V-4111

After a flight from PAF Base Nur Khan, Chaklala, Rawalpindi, at 1402hrs local time the aircraft landed at Sialkot Airport, where, after touchdown, it veered off the side of Runway 04 during the landing roll. It then ran into soft ground, causing the undercarriage to collapse and resulting in substantial damage. There were no reported injuries to the occupants but Runway 04/22 was closed for several hours after the incident.

D: November 26

N: Ecuadorian Air Force/ESMA/ Escuadrón Entrenamiento Aéreo/Esc 2412

T: Diamond DA20C-1 Eclipse

S: FAE1064

While on a local training flight from Base Aerienne Ulpian Páez at Salinas Airport, the aircraft experienced engine failure and was destroyed when it crashed at 1642hrs local time into Eleodoro Solórzano Avenue on the corner of Calle 18 street, La Libertad city. Both crew (Captain Diana Estefanía Ruiz Solís and cadet Juan Andrés Pacheco Ramírez) were killed, while the occupants of a vehicle and a motorcyclist were seriously injured and taken to La Libertad hospital. The aircraft was operated by the Escuela Superior Militar de Aviación (ESMA) at Salinas.

Additional material from: Scramble/Dutch Aviation Society and Asagiri Yohko.

The wreckage of Ecuadorian Air Force Diamond DA20C-1 Eclipse FAE1064 after it crashed in a busy street in La Libertad on November 17 FAE

Next Issue

The Luftwaffe's last two Tornado Wings, TaktLwG 51 and TaktLwG 33, operate in the SEAD and nuclear/precision ground attack roles
Gary Stray

Riding the whirlwind

The Tornado was the Luftwaffe's most numerous aircraft from the early 1980s. Today, just two wings remain, and they are due to be phased out by 2030. Kevin Wright talks with Tornado aircrew from both units.

NEXT ISSUE

The February issue is on sale from January 16, 2025

- **Gun for hire**
  Former South African Air Force Commandant Neall Ellis, a British national, is now the world's longest serving and still operating private military pilot. Al Vetner looks back at his remarkable career
- **Flying high**
  Bob Archer looks back at a hectic year of operations by the US Air Force units based at RAF Mildenhall in the UK and the active role they have played as tensions increased across the Middle East
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